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NOVEMBER 1986

AUTOMOTIVE INDUSTRIES

SINCE 1895

B-O-C Lordstown

B-O-C Lansing South

B-O-C Lansing North

Nissan Smyrna

THE BEST DAMN DIE CHANGE TEAM IN AMERICA

Honda Marysville

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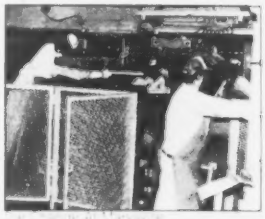
CHILTON'S AUTOMOTIVE INDUSTRIES SINCE 1895



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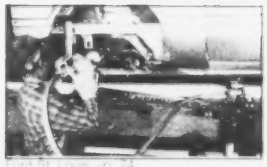

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CERAMICS IN ENGINES? NOT UNTIL PROVEN

Despite performance payoffs, ceramic engine parts still face reliability and cost problems—which are preventing their widespread acceptance.

by Jennifer Minzter

Commercialization of ceramic engine parts in the US may be crawling at a snail's pace, but steadily plodding R&D efforts could push the US industry to the forefront of what experts believe will be a $100 million US market by 1990. By the end of the century that figure could increase to $1.3 billion.

Currently, the Japanese are the only ones firmly pushing ceramic technology towards the production line: Nissan has a silicon nitride turbocharger rotor on its home market 200ZX and Porsche offers cast-in-place aluminum titanate ceramic manifold liners on its 944. Toyota featured a ceramic fiber-reinforced piston in its 2.0 L diesel in 1983.

In addition, Mazda has recently presented an SAE paper describing a prechamber cup in the indirect injection diesel made of silicon nitride. Several other Japanese companies have joined in ventures to quicken the pace of commercialization.

Market forces are providing the Japanese extra incentive: Engine builders pay a hefty tax on engines above 2.0 L. "There's a real strong driving force in Japan to maximize the efficiencies of small engines," explains Chrysler Corp.'s supervisor of Advanced Materials and Technology, John Corwin. "Ceramic parts, chiefly things like turbocharger rotors, go a long way towards helping that."

"In the US," continues Corwin, "there's not the market pull to put ceramic parts in automobiles. I don't think it would make any difference in our cars, as far as our marketability of the product, whether we would say it had a ceramic part in it or not. In Japan there's a certain national marketing hype that tends to give a marketing edge to products that contain ceramic components."

GTE's Buljan helped develop a whisker-reinforced composite ceramic shown here in a molded gas turbine rotor.

US R&D Efforts

That's not to say US ceramic makers are ignoring the potential. R&D, often backed by the Department of Energy and Department of Defense, has produced noteworthy results. Within the next two years, say industry experts, substitution of ceramics for valves and valve train components—turbocharger rotors, exhaust port liners—will occur in limited amount and in the early '90s they'll reach higher volumes.

For instance, Norton/TRW has tested ceramic valve performance in a 2.3 L non-turbocharged diesel engine and after 1000 hours of engine operation, design analyses have shown that the valves can withstand stress, temperatures and corrosive engine environments better than metal valves.

But this limited testing is hardly proof of the pudding. Says Ford's McLean, "These materials are inductile; they don't bend. They're not as tolerant of design inaccuracies as perhaps metals are. Because of that, if things aren't correct in the design, they can fail. The difficulty is that they haven't really been proven for thousands of miles of operation in thousands and thousands of automobiles. Until someone does that, you don't really know what the reliability is."

Assuming that reliability can be proven and development progresses smoothly, by the mid-'90s, engine design will evolve to accommodate ceramic subsystems. An example, says Norton/TRW's technical director of ceramics, Carr Lane Quackenbush, is a cylinder head which would have ceramic guides, seats, exhaust port liners and perhaps, camshaft lobes. "What you'll see is a complete system and then that system will be sold to the OE," says Quackenbush.

It won't be until the mid to late '90s that radical engines—low-heat rejection diesels (adiabatic) and ceramic gas turbine engines will be realized. Note that neither of these two engines is totally ceramic—the ceramic parts will be at key positions within the engines. Reiterates Quackenbush, "We do not envision ever seeing a totally ceramic engine."

At Chrysler's AMT division, Corwin says they are close to introducing valve train components—perhaps a roller cam follower or tappet wear face. "That could very well happen before 1990, at least in small volume," adds Corwin.

Ford is also working on a turbine engine in cooperation with the Garrett Corp., says McLean. The DOE-sponsored program, called the Auto-

motive Gas Turbine (AGT) program, is studying small gas turbines for automotive applications. The Ford/Garrett AGT design is a single shaft with symmetrical components, in which the ceramic components are heavily stressed.

General Motors' Allison Gas Turbine Div.'s DOE-sponsored AGT program is researching a two-shafted, two-rotored design that lessens the stress on the ceramic components involved but complicates the design.

Some ceramic suppliers are increasing ceramic strength and reliability with composite materials. Just announced by GTE Laboratories is the development of a silicon nitride matrix with a silicon carbide whisker composite which, according to the company, is 40% more resistant to internal fracturing and 25% stronger than monolithic ceramics.

The composite development program at GTE is DOE-funded and monitored by the Oak Ridge National Laboratory's three-year-old Ceramic Technology Project. Explains GTE's Tom Buljan, principal researcher on the composite program, the contract involves materials development first, then a low-cost process for manufacturing near-net shape (*see Sept. '86 AI, p. 70*) ceramic parts from pistons to piston liners to rotors.

At Standard Oil (Sohio) Engineered Materials Co.'s $5 million research center in Niagara Falls, NY, development work is centered around ceramic fiber reinforcement of aluminum pistons. For this project, Sohio is using its Fiberfrax, a 49.2% alumina/50.5% silica fiber. The importance of Fiberfrax is its cost: at $1/lb Fiberfrax is cost-efficient for automotive applications. The material is currently being testing for wear and thermal cracking resistance. Other applications include combustion bowls, piston rings and wrist pin areas.

In a program sponsored by the US Army's Tank-Automotive Command (TACOM) to test the friction resistance of silicon carbide and silicon nitride in an adiabatic diesel engine, Sohio is testing a single cylinder engine with two horizontally opposed pistons, using no cooling and no lubrication.

Adiabatic (uncooled) engines pose a major problem, however, and it's one no one yet knows how to solve. As the engine is increasingly insulated, the temperature of the ceramic components goes higher and higher, the NOx emissions shoot up and the oil starts to cook. "At a temperature above 600°C," says Quackenbush, "people have come to a loss as to how to liquid lubricate them."

Ceramic Parts In Production

Ceramic Part	Car Maker	Ceramic Maker	Intro Date	1986 Usage
Diesel Glow Plug	Isuzu	Kyocera	1981	400,000
	Mitsubishi	Kyocera	1983	
	Toyota	Toyota	1984	
	Caterpillar	Kyocera	1986	
Pre-Combustion Chamber	Isuzu	Kyocera	1981	15,000
	Mazda		1986	
	Toyota		1986	
Exhaust Port Liner	Porsche	Hoechst		
Rocker Arm Pad	Mitsubishi		1984	
Turbo Rotor	Nissan	NTK	1985	500/mo.

The Tribo Needs

In Japan Hino Motors Ltd. has just announced the development of a high-performance ceramic compound turbocharged diesel engine for heavy-duty trucks. About 40% of this engine's cylinders, pistons and other combustion chamber parts are ceramic—those parts demanding heat and wear resistivity. Other parts are primarily made of cast iron. According to Hino, horsepower has been boosted 10%, while fuel costs dropped 30%. Part of this engine's innovative design is its unique exhaust gas recovery system which uses an electronically-controlled CVT system to keep exhaust gas recovery efficiency at maximum levels regardless of speed and load.

Hino says its research shows that keeping the ceramics usage at about 40% of engine parts is optimal.

Here in the US Cummins Engine Co. is working with the DOE and US Army on an uncooled engine using zirconia to insulate the cylinders and pistons. The heat in the combustion chamber and exhaust is used to power a turbocharger for increased power.

While R&D may be the moving force behind ceramic development, cost is still applying the brakes to commercialization. Chrysler's Corwin, who maintains US suppliers are much farther ahead of the Japanese in the area of tribology—wear and friction resistance—says that although the Japanese are getting the job done, they are not cost-conscious like US suppliers.

"There are certain ceramics—more expensive ones silicon nitride, silicon carbide," explains Corwin, "that tribologically are very good materials. But they're very expensive materials. What we're trying to do is satisfy all the tribo needs with a much, much less costly material. We're getting into oxide ceramic systems.

"Our goal is to get cost competitive with the metal parts," he says. "In general we're not willing to pay a premium price for ceramic parts that are substitutional for metal parts even though they may have a slightly better projected life, and maybe slightly better performance.

Corwin explains that the "who's ahead" philosophy is a major difference between the current US and Japanese approaches to ceramics use. "I think some of the Japanese companies put ceramic parts in their automobiles, even at a terrific cost penalty, just so they can get the market advantage of saying they have it," he says.

So the question remains: Can automakers and ceramics makers meet the performance, reliability and cost criteria of ceramics? AI

AUTOMAKER QUARTERLY REPORT

Third quarter '86 results show Ford in the passing lane, Chrysler and Honda with a drop in earnings and continued strength at Subaru.

by Tom O'Grady

Domestic Auto Sales (3rd Quarter Results)

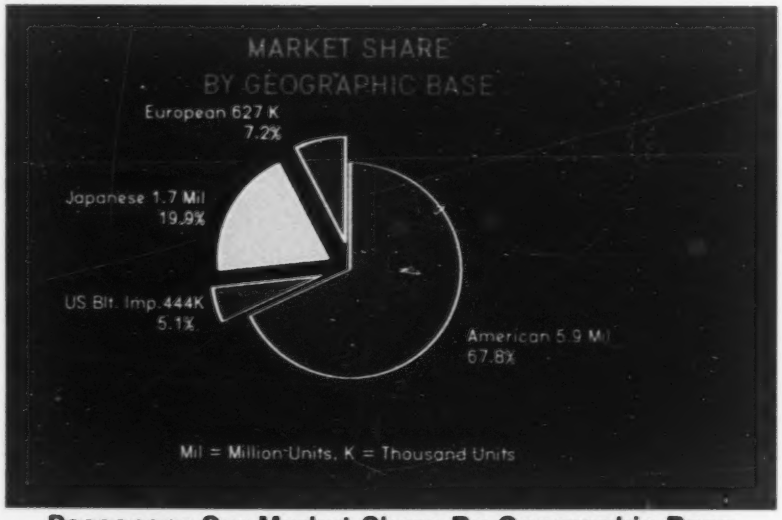
Carline	'86	'85	% Change
Escort	113,906	116,359	(2%)
Celebrity	100,327	104,270	(4%)
Olds 88	97,515	49,501	49%
Ciera	92,816	91,845	1%
Cavalier	90,187	109,627	(22%)
Accord*	81,428	49,274	39%
Tempo	74,106	74,350	0%
Nova	76,504	13,127	83%
Century	67,773	68,404	(1%)
6000	65,932	48,366	27%

*—Includes imports
( )—Negative value

'86 Domestic Light Truck Quarterly Production

Truckline	1-'86	2-'86	3-'86
Chrysler Vans	35,643	29,344	19,651
. Sport Utility	6,407	6,663	6,441
....Miniwagon	75,881	77,051	56,811
Lt Conventional	5,660	34,370	48,812
Ford Aerostar	48,654	45,827	41,142
.....Bronco	13,373	15,407	10,322
..... Econoline	61,782	62,902	45,957
..... Ranger	81,879	86,950	73,124
..... Bronco II	34,147	31,862	25,081
..... Light Conv.	109,848	177,432	146,735
Chevy..Blazer	9,802	7,834	6,352
.....Suburban	17,766	17,450	13,582
..... P-Model	9,898	13,141	7,608

Truckline	1-'86	2-'86	3-'86
.....S-10	64,080	61,889	66,846
.....Blazer S	48,460	42,389	42,977
.....Astro	39,317	42,127	39,270
..... Van	50,348	43,383	27,386
Light Conventional	120,943	114,224	89,385
GMC . Jimmy	2,394	2,179	2,263
.... Suburban	6,000	6,398	5,989
..... P-Model	1,659	1,508	1,135
.....S-15	16,952	16,834	16,646
..... Jimmy S	12,588	11,539	12,053
..... Safari	9,314	10,394	9,632
..... Van	14,487	14,956	8,069
Light Conventional	40,225	39,658	30,213
Nissan. Pkup	18,463	46,222	23,135



Passenger Car Market Share By Geographic Base

Manufacturers	Total Sales	Total Market Share
American	5,942,605	67.84%
Japanese	1,743,901	19.91%
European	627,555	7.16%
US Built Imports (VWoA, Honda, NUMMI, Nissan, Renault)	444,920	5.08%
Total	8,758,981	100.00%

US Passenger Car Market Shares To Date

Manufacturer	Sales	% Total
General Motors	3,751,578	42.85%
Ford	1,569,975	17.93%
Chrysler	1,010,887	11.55%
Honda	475,528	5.43%
Toyota	448,524	5.12%
Nissan	414,279	4.73%
VW	161,679	1.85%
Subaru	137,283	1.57%
AMC/Renault	61,255	0.70%

Thomas O'Grady heads Integrated Automotive Resources, Inc. in Wayne, PA. (215) 647-6978.

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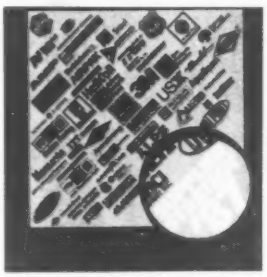

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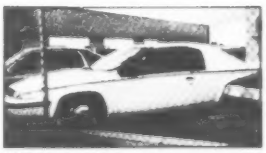

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Unemployment: The Price Of Overcapacity

by Jim Harbour

Manufacturing cars in the United States and Canada is an enormously profitable business, particularly the assembly of sub-compact and compact cars, right? It must be, because Honda recently expanded its operations to make Civics at Marysville; Toyota is bringing a compact to Kentucky; Mitsubishi is coming to Illinois; Mazda is building in Michigan.

The story of the Japanese rush to assemble cars and trucks in the US and Canada has already been editorialized to death in the national media and the local tabloids. What I really want to highlight is *who's* going to pay for this enormous increase in new assembly capacity. That's right, the real question is how many hourly and salary workers will eventually face unemployment as a direct result of this expansion?

You would think that the North American car and truck market was about to explode by 30%, based on capacity increases planned. Appearances, however, can be deceiving. We're planning to increase assembly capacity to 21.3 million units annually. That's what the government in Washington and every statehouse in the Midwest wants because the bottom line is jobs, jobs, jobs. Right?

In the drive to financially assist these upstarts and grant innovative labor contracts to every assembler who wants to set up shop in North America, we're ignoring the fact that we're assisting overcapacity.

The best retail car and truck sales the North American market can presently hope for is only 16.6 million units annually, so by 1991 there will be an excess of some 4.7 million units of assembly capacity. You can assume the new capacity being built by Honda, Toyota, MMC, Mazda and the others is going to be fully used to supply the "Everlasting Customer" with a superb quality car.

That obviously leaves this writer with visions of a "worse case scenario" where Ford, GM, Chrysler and AMC annually lose $4.7 million in car and truck production and sales.

Jim Harbour is a manufacturing consultant in Bloomfield Hills, MI.

This worse case scenario means the automotive manufacturers would close some 40 major manufacturing plants including 20 assembly, 4 engine, 8 stamping and 2 foundries plus brake, suspension and steering plants. The industry would also lose a ton of outside supplier plants.

The domestic manufacturers could pay the price of not being competitive in quality and productivity; for years of talk but no action; for planning without specific goals; for philosophizing the whats, justifying the whys and finger pointing the blame at someone else.

Who pays the piper for neglecting quality and productivity? Obviously everyone from stockholders to management. But the real losers, when 4.7 million cars and trucks built by Chrysler, Ford, GM and AMC go down the tubes will be the salary and hourly workforce—400,000 of them.

You don't think it could happen? Just take a look back to see where we've been. Imports had only 5.4% of the 1965 car and truck market and that increased to 23% in 1985. Attrition in that 20-year span claimed 282,000 workers. So it's not hard to believe that another 400,000 will be lost if the domestics lose another 4.7 million units.

Unfortunately, when the domestic manufacturers lose a million units, they force unemployment on 85,000 workers because of high integration levels. It's not just assembly losses, but also stampings, engines, transmissions, brakes, steering, suspension, etc. In contrast, when foreign manufacturers come to the US all you get is assembly, stamping, wheels, tires and seats.

The die is cast: The foreign manufacturers are bringing their assembly plants to the US. Will the domestic manufacturers, the UAW and the entire workforce just sit back and accept it? They can, and if they do, they'll pay the price with their jobs. The alternative is for management and the UAW to sit down now and address the industry's non-competitiveness and define an *immediate* action plan to meet the competition head-on.

Clean up your act, company management and UAW management or this once dynamic industry will be but a skeleton of what it once was. Take no consolation in believing these 400,000 potential job losses will be covered by pensions, because the lowest hourly and salary workers on the seniority totem pole will go. The real point is not who can retire. The point is: Don't leave as your legacy a non-competitive industry where your children have no opportunity to get a job. AT

Plant Capacity (In Millions Of Units)

Ford/GM/Chrysler/AMC (Current)	13.7
VW/Honda/Nissan/NUMMI/Volvo (Current)	1.1
Honda/MMC/Toyota/Mazda/AMC (Renault)/Others (Under Construction)	1.3
Saturn (Under Construction)	0.5
Import capacity in place in Korea/Japan/Europe/Mexico	4.7
Total capacity	21.3

SUPPLIER-SIDE ECONOMICS: THE SILENT MAJORITIES SPEAK

Supplier executives talk turkey in our informal survey on profits, spending and dealing with the OEMs.

by Jennifer G. Mintzer

It ain't fair. It seems every time Lee Iacocca lets loose with a "lemmetellya," it registers a ten on the media's Richter scale. The spotlight rarely shines as brightly on the 30,000-plus suppliers who feed America's car and truck building combines.

Instead, these companies tend to be the silent majority in the auto industry, the ones who have to deal with 30% price cut demands and eroding market share, without analysis by Dan Rather or film at 11. That's why ***AI*** has surveyed executive vice presidents, presidents, chairmen and CEOs from 65 major automotive OEM supplier companies. We wanted their views on where the US supplier base is headed and why.

Selling Japan

Top of the list of concerns voiced by nearly all suppliers to the automotive industry is the frustration of trying to sell to the Japanese transplants—Japanese automakers setting up shop in the States. Most of the suppliers surveyed report they have approached Japanese automakers, but have met with little success. In fact, some say they can't get past the guard house. Among the reasons cited for failure is that decisions are being made by the Japanese home office, qualifying products is a long, arduous task and the product specifications are determined in Japan. (*See sidebar, "Success Limited at Transplants."*)

Bedfellows or Bedbugs?

What about the relationship between US automakers and US suppliers? To put it in a nutshell, the relationship has improved in general, but suppliers assume the credit, claiming they do their homework so they are sure to meet automakers' needs. Both parties, suppliers say, are looking at the long-range and developing joint research teams. The monkey wrench fouling up the works is what one supplier terms "strictly price-thinking." Says a plastic company executive, "They need us now; perhaps tomorrow they won't feel that way."

Suppliers agree that cooperation has increased, although on the whole, makers of production equipment are fairing better (80% see improvement) than parts and components suppliers (65%); while materials people (74%) float between.

James Giammarco, automotive sales director at Parker Chemical, approves of the direction the supplier/OEM relationship is moving: "Supplier-customer teams are established for both normal problems and problem-solving. Early sourcing is now a noticeable trend."

Norman Blachford, president of H. L. Blachford Inc., a noise control materials and plastics supplier, agrees: "They have reduced the supplier base, issued longer term contracts and

become more quality-conscious—all requiring more cooperation."

Nearly three-quarters of all suppliers may agree that cooperation has favorably flavored the working environment, but that's not to say there's no heat in the kitchen. In short, some feel they're getting singed, if not downright burned by a relationship that tips the scales far more toward the OEMs than a 50/50 partnership should allow. For a taste of their dissatisfaction, see the sidebar, *"Days of Whine & Ruses."*

Predicting Growth

Although the majority of suppliers view the next one to two years as a period of modest growth and profitability, many are more enthusiastically optimistic when they look just a bit farther down the road—say, three to five years.

Commitment to improving operating procedures and reliability levels is paramount to suppliers' plans to increase profitability and improve sales penetration in 1987 and the longer term. To guarantee continued growth, many suppliers are broadening their base—either by moving offshore to supply overseas automakers or by diversifying into related fields.

The key to remaining competitive is a global approach and success in

(Continued on p. 87)

Will you diversify away from OEM automotive business?

	Yes	No	Already Have
Mfg./Prod.	25%	50%	25%
Parts/Components	33%	60%	7%
Materials	39%	52%	9%
Total	35%	57%	8%

Days of Whine and Ruses

Although the majority of the suppliers we interviewed say their relationships with automakers have improved, most also complain that there is more rhetoric than actual cooperation taking place. And although the automakers maintain they are looking for the highest quality parts available, suppliers retort that price is still the favorite son, while quality ranks as the not-quite-so-attractive stepsister.

Toledo Blank's president Joseph McCaffery says automakers are "somewhat more cooperative, but no smarter. They're too price conscious, not cost-conscious." One electronics supplier president labels the pressure to reduce prices "excessive."

If taken on a carmaker-by-carmaker basis, Ford Motor Company comes out the clear winner of the cooperation award from suppliers in materials, parts and components and manufacturing products. On the other hand, GM sits far down on the totem pole.

Rating each automaker separately, one material supplier VP says, "Ford has made good efforts here. C-P-C is trying, but the bulk of GM has far to go. GM subsidiaries vary. Rochester Products Div. is good, Saginaw awful. Chrysler is hard to say." Agrees the executive VP at a major nonferrous material supplier, "Less cooperative. This is particularly true with GM in my experience."

Echoing the verdict of "less cooperative" is the marketing manager of a US specialty steelmaker, who says, "Evolution of world market suppliers is putting American suppliers in a more subservient role. Survival instinct is preempting past relationships; cooperation is commensurate with need and supply/demand relationship."

Parts and components suppliers who in general see the relationship in a less cooperative light, mention that automakers are strong on rhetoric, but weak on the follow-through. "There has been little change," says the VP of a rubber products supplier. "In spite of their verbage we still see them with a business-as-usual attitude—but with a smaller supplier base." "Behind the rhetoric there is little difference," agrees the president of another rubber supplier. And lest you think rubber suppliers are the only ones feeling blue, the VP of manufacturing operations for a major onboard parts supplier, commiserates, "Customers are being more arbitrary in their expectations and decisions. They do not use reason to the extent they should and they are vesting decisions in junior employees with too little experience. Also customers are using fear as a management tactic both internally and externally. This is affecting the quality of decision making." In fact, some say, "The trendy thing is to think and act globally even if local supply is available and competitive."—*JGM*

Are American automakers more cooperative with American suppliers today?

	More	Less	Same
Mfg./Prod.	80%	0%	20%
Parts/Components	65%	27%	8%
Materials	74%	22%	4%
Total	70%	22%	8%

Facing The Future With Four-Barrels

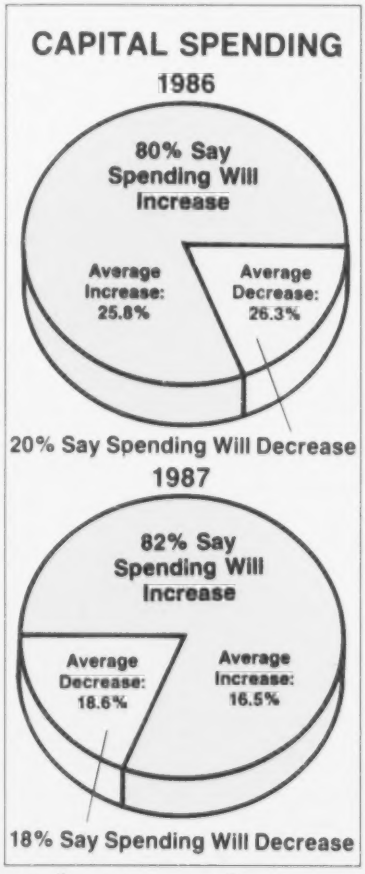
Across the board, suppliers view the future favorably. The message that comes through loud and clear is that profitability and increased sales are possible, but it will take hard work on the part of the suppliers themselves. It's a "pull ourselves up by the bootstraps" attitude.

Materials Outlook

Materials suppliers in general seem to view the short-term in less enthusiastic terms than components and manufacturing types. They are more optimistic about the long-range, however, and currently are implementing programs designed to ensure future growth: capital investment and productivity efforts to lower product cost.

The picture among ferrous metal suppliers is difficult to peg precisely. One major US steel company reports increased profitability (no amount specified) in both '86 and '87, coupled with increased capital spending of 16% in '86. This particular supplier currently sells successfully to several US-based Japanese manufacturers and notes that only 29% of sales are OEM automotive. On the other hand, a 100% automotive OEM steel supplier says sales and profits will not change, but capital spending will increase 10% and 25% respectively in '86 and '87. This supplier reports no success with the Japanese transplants. And taking the scenario one step farther is a supplier of stainless steel, 30% of which goes to automotive OEMs. Sales here are pegged to increase 2% for both years; profitability will bolt 100% in '86 and 15% in '87; capital spending will be increased 5% and 10% respectively. This supplier has not yet attempted to sell to the Japanese.

Plastics suppliers are nearly unanimous in forecasting growth for the long-term. Banking on increased use of plastics in automobiles, one 70% automotive OEM supplier pegs growth at somewhere around 20% for three years. But even plastics suppliers believe "major ventures will be needed."



Sales for '86 will rise an average 14% among plastics suppliers; for '87, 12%. The outlook for profits among plastics suppliers is more diverse and dependent upon plans for capital spending which will rise an average 12% in '86 and nearly 20% in '87. The percentage of automotive OEM business varies widely among plastics suppliers with 63% reporting 70% or more automotive OEM sales. Growth optimism is tempered by calls for cash control and major ventures.

Sixty-two percent of suppliers of non-ferrous materials, rubber, coatings and other materials plan major capital expenditures in '86 and '87 to combat what many view as a short-term downturn. They expect moderate to good performance in the longer term.

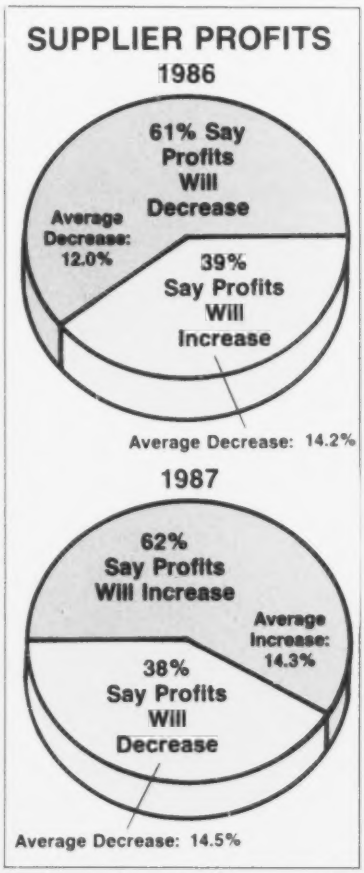
Says one glass manufacturer, "We are remaining very flexible and willing to evaluate every possible opportunity, be it split business or joint venture." Auto sales director at Parker Chemical James Giammarco notes, "We see growth in the core business with increases in new venture sales designed to broaden our base and address single-supplier and/or reduced supplier goals of our customers."

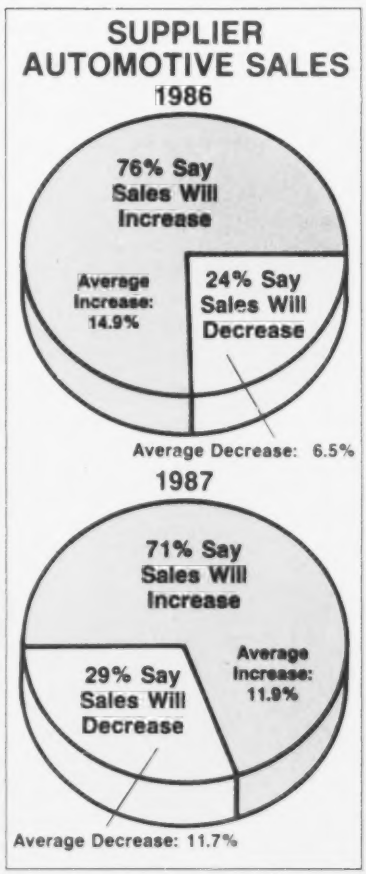
Capital Equipment's View

Machine tool builders cast a near 100% vote for growth. On average manufacturing and production equipment suppliers plan to increase capital spending 41% in '86, 11.3% in '87. Sales will hit 29.6% in '86 and 21.5% in '87, on the average, while the profit picture is tempered. For '86 profits will increase 26.6% and 9% in '87. Twenty-eight percent of the production equipment suppliers reported a decrease in automotive sales for '87, ranging from -2% to -15%. The decrease will affect '87 profits 20% on the down side and capital spending will fall an average 24% for '87. Still this sector reports a good long-term outlook.

Components Consensus

Parts and components manufacturers in general see growth potential in the coming years, and many are planning major capital expenditures either this year or next. A decrease in automotive sales for parts and components manufacturers in '86 seems to lead directly to an increase in capital spending for '87 and a resultant decrease in profits as these suppliers gear up to become more competitive. According to group VP Timothy Lewliette of Bendix Electronics, which has sales of 90% automo-





tive, the outlook is, "Very positive. We are investing $200 million in expansion and increasing engineering to 10% of sales."

Perhaps exemplifying the reaction of parts and components manufacturers to increased pressure from foreign suppliers is the president of an onboard parts and components supplier who reports a 12% decrease in '86 sales, a 50% decrease in '86 profits and a 25% decrease in capital spending for this year. Next year he predicts a 50% increase in capital expenditures, an 8% sales increase and 81% increase in profits. The outlook: "Good to excellent. We have become the lowest cost producer in our market."

Schrader Automotive (Canada) president A. Vallet-Sandre predicts his company's OEM automotive sales will decrease 4% in '86 and 2% in '87. Profits which will decrease 3.1% in '86 will rise 0.1% in '87, a year in which Schrader Automotive plans a 275% increase in capital spending! Says Vallet-Sandre, "Growth may be adversely affected unless we can become an ongoing supplier to foreign manufacturers establishing in North America."

Capital expenditures are seemingly a response to increased global pressure to become competitive. Despite predictions for '86 and '87 (sales decreases of 5% and 11% respectively), a major US transmission component manufacturer will increase capital spending 32% in '86. Profits will slip 4% this year and 22% next year, the VP of manufacturing operations reports. "As our customers implement their plans to rely on foreign producers for much of their car lines, the outlook is tough. We will weather this problem with quality and cost improvements and the sales of related components and sub-assemblies," he reports.

A competitor in the transmission components field reports an 8% decrease in '86 sales, an 11.2% profit decrease, but a whopping 167% increase in '86 capital spending. How will this affect the company's '87 outlook? Well, according to the director of product planning, sales will increase 4% in '87, while profits will slide a mere 0.3%. This supplier predicts "Flat to slow growth into the year 2000. The possiblity of introducing new products to expand the product base" is being considered.

Others with more positive views of the future still plan to spend a hefty amount on capital equipment. Says Daniel Monighan, chairman and president of Van Dresser Corp., "Our long term outlook is excellent. We will be among those OEM automotive suppliers who survive and thrive." But a price will be paid. Van Dresser will increase capital spending 40% in '86, 90% in '87; '86 sales for the company are pegged to rise 35%.

CEO and president of Simpson Industries, R.W. Navare, whose company is 90% OEM automotive, says, "We feel very upbeat about our business." He predicts sales increases of 24% and 10% in '86 and '87, respectively; profits to rise 23% and 10%, and capital spending to increase 130% in 1986. The president of another 100% automotive OEM onboard parts and components manufacturer predicts strong growth in the automotive industry. His company pegs sales to rise 15% this year and next; profits to increase 30% for both years and capital spending to increase 30% in '86.—*JGM*

Supplier Strategy

AI SUPPLIER 200

An alphabetical assembly of the industry's heavy hitters.

	1985 Sales*	1985 Profit*	% Return On Sales	% Return On Equity
Acme-Cleveland	N.A.	N.A.	N.A.	N.A.
Atlas-Copco	N.A.	N.A.	N.A.	N.A.
Airpax Corp.	N.A.	N.A.	N.A.	N.A.
Air Products	1,830	143	7.8	12.3
Akzo Coatings	N.A.	N.A.	N.A.	N.A.
Alcoa	5,163	-16.6	--	--
Algoma Steel	N.A.	N.A.	N.A.	N.A.
Allen Group	3,992	16.6	N.A.	10.4
Allied Chemical	N.A.	N.A.	N.A.	N.A.
Allied-Signal	9,115	-279	--	--
Allis-Chalmers	961	-168	--	--
ALPS Electric	N.A.	N.A.	N.A.	N.A.
Amcast Industrial	N.A.	N.A.	N.A.	N.A.
Amchem	N.A.	N.A.	N.A.	N.A.
American Micro Systems	N.A.	N.A.	N.A.	N.A.
American Motors	4,093	-125	--	--
AMP	1,636	108	6.6	10.8
Apollo Computer	296	-1.5	--	--
Applicon	N.A.	N.A.	N.A.	N.A.
Atlantic Richfield	22,357	-202	--	--
Armco	4,106	55	1.3	5.0
Armstrong Rubber	767	16	2.1	6.7
Armstrong World Ind.	1,679	101	6.0	13.8
Arvin Ind.	820	35.9	4.4	14.4
ASEA	N.A.	N.A.	N.A.	N.A.
Ashland Oil	7,891	147	1.9	12.7
Atlas Copco	N.A.	N.A.	N.A.	N.A.
AT&T	34,909	1,556	4.5	9.9
Automatix	N.A.	N.A.	N.A.	N.A.
Ball Corp.	1,106	51.2	4.6	15.5
BASF	2,568	38.9	1.5	4.2
Bethlehem Steel	5,117	-196	--	--
Bloxcom Corp.	N.A.	N.A.	N.A.	N.A.
Borg Warner	3,963	178	4.5	10.8
Robert Bosch	N.A.	N.A.	N.A.	N.A.
Briggs & Stratton	717	33.5	4.7	11.8
Budd Co.	N.A.	N.A.	N.A.	N.A.
Buehler Products	N.A.	N.A.	N.A.	N.A.
Carpenter Technology	556.7	24.5	4.4	7.7
Caterpillar	6,769	198	2.9	6.5
Celanese	3,046	178	5.8	17.5
Champion Spark Plug	829.4	15.2	1.8	4.1
Cherry Automotive	126.2	N.A.	2.8	6.4
Chrysler	21,255	1,635	7.7	38.8
Chrysler Divers. Prods.	N.A.	N.A.	N.A.	N.A.
Chrysler Electronics Gp.	N.A.	N.A.	N.A	N.A.
Cincinnati Milicron	732	-44.7	--	--
Clark Equipment	964	-65.4	--	--
Colt Ind.	1,579	138	8.7	34.1
Combustion Eng.	3,110	-94.4	--	--

	1985 Sales*	1985 Profit*	% Return On Sales	% Return On Equity
Computervision	441	-80.7	--	--
CRC Evans	N.A.	N.A.	N.A.	N.A.
Cross & Trecker	434	11.9	N.A.	5.6
Crown Cork & Seal	1,487	71.7	4.8	13.5
Cummins Engine	2,146	50.3	2.3	7.4
Cyclops Corp.	1,385	26.2	1.9	12.1
Dana Corp.	3,754	165.1	4.4	13.8
Datcon	N.A.	N.A.	N.A.	N.A.
Deere and Co.	3,163	31	0.89	1.3
Delco Elect.	N.A.	N.A.	N.A.	N.A.
Delco Remy	N.A.	N.A.	N.A.	N.A.
Diemakers	N.A.	N.A.	N.A.	N.A.
Dow Chemical	11,537	58	0.5	1.2
Dow Corning	901	95.2	10.6	16.5
Dresser Ind.	4,111	-196	--	--
Duncan Electronics	N.A.	N.A.	N.A.	N.A.
DuPont	29,483	1,118	3.8	8.8
Eagle Picher Ind.	641	-119.8	--	--
Eaton	3,674	231	6.3	16.6
EDS	3,444	190	5.5	35.6
Emhart	1,775	80.5	4.5	13.2
Empire-Detroit	N.A.	N.A.	N.A.	N.A.
Englehard	2,263	42.6	1.9	8.3
Environmental Tectonics	N.A.	N.A.	N.A.	N.A.
Essex Specialty Prods.	N.A.	N.A.	N.A.	N.A.
Ex-Cell-O	1,140	57.5	5.1	11.6
Federal Mogul	895.4	51.9	5.8	15.3
Firestone	3,836	3.0	0.1	0.3
FMC Corp	3,260	196.5	6.0	17.5
Ford	52,774	2,515	4.8	20.5
Foxboro Corp.	572	-34.1	--	--
GAF	731.9	77.5	2.5	8.1
GenCorp	3,020	75.2	2.5	8.1
General Electric	28,285	2,336	3.8	8.8
General Instrument	993.8	-9.6	--	--
General Motors	96,371	3,999	4.2	13.5
Gleason Corp.	N.A.	N.A.	N.A.	N.A.
B.F. Goodrich	3,250	-354	--	--
Goodyear	9,896	412.4	4.2	11.8
Goshen Rubber	N.A.	N.A.	N.A.	N.A.
Gould	1,520	-175.7	--	--
GTE	15,732	-161	--	--
Hercules	2,587	133.1	5.2	9.0
Hewlett-Packard	6,505	498	7.5	12.3
Holley Automotive	N.A.	N.A.	N.A.	N.A.
Honeywell	6,624	281.6	4.3	11.0
IBM	50,056	6,555	13.1	20.5
ICI	N.A.	N.A.	N.A.	N.A.
Imperial Clevite	N.A.	N.A.	N.A.	N.A.
Indian Head Ind.	N.A.	N.A.	N.A.	N.A.

*—In millions of dollars. Figures taken from Fortune 500, Business Week 1000 and company annual reports.

	1985 Sales*	1985 Profit*	% Return On Sales	% Return On Equity
Inland Steel	3,186	-178	--	--
Inmont Div.	N.A.	N.A.	N.A.	N.A.
Intel	1,364	1.5	0.1	0.1
Instareed	N.A.	N.A.	N.A.	N.A.
IPC	N.A.	N.A.	N.A.	N.A.
ITT	12,714	293	2.3	4.5
Kaiser Aluminum	2,701	-186	--	--
Kawasaki Steel	N.A.	N.A.	N.A.	N.A.
Kelsey-Hayes	N.A.	N.A.	N.A.	N.A.
Kusan Mfg.	N.A.	N.A.	N.A.	N.A.
Laser Ident. Systems	N.A.	N.A.	N.A.	N.A.
Lear-Siegler	2,370	100.7	4.3	15.7
Libbey-Owens-Ford	1,921	74.6	3.9	10.4
Litton	4,590	299.4	6.5	31.9
Loctite	240	19.1	N.A.	13.8
LTV	8,198	-723.9	--	--
Lubrizol	903.4	60.2	6.7	11.6
Mack Truck	2,063	-59.2	--	--
Magna International	690.4	43	6.2	14.1
Magnavox	N.A.	N.A.	N.A.	N.A.
Mahle	N.A.	N.A.	N.A.	N.A.
Maremont	N.A.	N.A.	N.A.	N.A.
Maxwell	N.A.	N.A.	N.A.	N.A.
Micro Barcode	N.A.	N.A.	N.A.	N.A.
Midland-Ross	763	19.4	2.2	8.0
Mobay	1,599	77	4.8	12.4
Modern Machine Wks.	N.A.	N.A.	N.A.	N.A.
Molex, Inc.	253	31	12.2	19.7
Monsanto	6,747	-98	--	--
Morton Thiokol	1,958	198	10.1	28.1
Motor Wheel	N.A.	N.A.	N.A.	N.A.
National Steel	N.A.	N.A.	N.A.	N.A.
Navistar International	3,457	105	--	10.1
New Departure/Hyatt	N.A.	N.A.	N.A.	N.A.
New England Instrument	N.A.	N.A.	N.A.	N.A.
Nippon Kokan	N.A.	N.A.	N.A.	N.A.
Nippon Steel	N.A.	N.A.	N.A.	N.A.
Nordson Corp.	140	9,714	7.0	13.4
North American Philips	4,395	82	1.9	7.8
N. American Royalties	N.A.	N.A.	N.A.	N.A.
Norton Corp.	1,193	-130	--	--
Nuodex	N.A.	N.A.	N.A.	N.A.
Optical Gaging	N.A.	N.A.	N.A.	N.A.
Owens-Corning Fiberglas	3,305	131	4.0	13.9
PACCAR	1,893	73	3.9	10.2
Parker White Metal	N.A.	N.A.	N.A.	N.A.
PDA Engineering	15	2	12.7	19.3
Phillips Petroleum	15,676	418	2.7	24.7
PPG Industries	4,345	303	7.0	17.8
Plymouth Tube	N.A.	N.A.	N.A.	N.A.
Prab Robots	N.A.	N.A.	N.A.	N.A.
Pyle National Div.	N.A.	N.A.	N.A.	N.A.
Quaker State	974	46	4.7	14.7
Quanex	N.A.	N.A.	N.A.	N.A.
Raychem	679	28	4.2	8.0
Rexnord	1,103	36	3.3	7.7
Rexroth	N.A.	N.A.	N.A.	N.A.
Reynolds Metals	3,415	-292	--	--
Rockwell International	11,338	595	5.3	20.2
Sealed Power	624	30	4.8	11.7
SECO	N.A.	N.A.	N.A.	N.A.
Sermatech Int.	N.A.	N.A.	N.A.	N.A.
Sheller Globe Corp.	918	364.0	15.3	
Sherwin-Williams	2,195	74	3.4	16.0
Signal Companies	N.A.	N.A.	N.A.	N.A.
Simpson Ind.	N.A.	N.A.	N.A.	N.A.
A.O. Smith Corp.	932	41	4.4	17.4
Snap-On Tools	591	60	10.1	17.7
Soudronic Ind. Div.	N.A.	N.A.	N.A.	N.A.
Stanadyne	484	30	6.3	14.8
Stanley Works	1,208	78	6.5	15.6
Sterling Eng. Prod.	N.A.	N.A.	N.A.	N.A.
Sumitomo	N.A.	N.A.	N.A.	N.A.
TCI Superior	N.A.	N.A.	N.A.	N.A.
TRW	6,615	-7.1	--	--
Tecumseh Products	829	60	7.2	12.5
Tektronix	1,438	90	6.3	10.6
Teledyne	3,256	546	16.8	34.6
Textron Inc.	4,990	.252	5.1	15.4
Thomson Industries	N.A.	N.A.	N.A.	N.A.
3M	N.A.	N.A.	N.A.	N.A.
Timken	1,090	-4	--	--
TradeArbed	N.A.	N.A.	N.A.	N.A.
USX	18,429	409	2.2	6.1
Union Carbide	9	-581	--	--
Uniroyal	2,115	N.A.	N.A.	N.A.
United Technologies	15,748	313	2.0	7.2
Van Dresser Ind.	N.A.	N.A.	N.A.	N.A.
Vickers	N.A.	N.A.	N.A.	N.A.
Walbro Corp.	N.A.	N.A.	N.A.	N.A.
Wallace-Murray	N.A.	N.A.	N.A.	N.A.
Weirton Steel	1,156	61	5.3	6.0
Wheland Foundry	N.A.	N.A.	N.A.	N.A.
White-Consolidated	1,946	34	1.8	6.5
Wickes Companies	2,806	28	--	0.2
Winnebago Industries	424	18	4.3	13.3
Witco Corp.	1,449	57	3.9	13.7
Young Radiator	N.A.	N.A.	N.A.	N.A.
ZF of North America	N.A.	N.A.	N.A.	N.A.
Zollner Corp.	N.A.	N.A.	N.A.	N.A.

(Continued from p.57)

cracking the Japanese transplant market. "Exports will be an important element of our success," confides the president of an onboard parts and components manufacturer. Quality and price competitiveness will remain all-important, but many vendors believe equally important to automakers will be engineering and technical support provided by suppliers.

Many see their sales rising, but profits will at best remain stable or become increasingly difficult to maintain. Says a rubber company president, "We'll work hard to remain a survivor. No question that there will be some fallout among current vendors. Those who survive *may* show real growth."

Other suppliers contemplate new product introductions to maintain a toehold on the market. Says a drivetrain part supplier's director of product planning, "We see flat to slow growth into the year 2000. Then we see the possibility of introducing new products to expand our base."

Those who paint the scene gloomy blame cost pressures for the dismal outlook. Says the chairman and CEO of a ferrous metals supplier, "It's difficult to make a profit with cost pressures placed on us by automotive OEMs who are asking and getting 5% per year price decreases over a three-year contract."

These suppliers could sum up their plans for continued growth in one word: Flexibility. Whatever it takes to stay afloat and even execute some fancy strokes is what they'll do. AI

Suppliers Find Limited Success At Transplants

Toledo Blank Inc. president Joseph McCaffery speaks for about 90% of US suppliers trying to sell to the Japanese automakers setting up shop in the US when he says it's "mission impossible."

According to suppliers of manufacturing and production equipment, capital equipment is purchased almost entirely from vendors in Japan. Said one machine tool company's divisional president, "We tried to interest Diamond Star in our products, but found selection had already been made in Japan by officials of that joint-venture project."

Parts and components suppliers, of which 80% say they have *tried* to sell to the Japanese transplants claim, "So far few components we make are being assembled in the US—transmissions, steering and brake parts." The president of an onboard parts and components supplier claims, "Japanese manufacturers also demand exchange rate sharing on components supplied to US manufacturers from their Japanese suppliers, which the Japanese supplier then refuses."

Success is limited, but at least 10% of the parts and components people we surveyed have made inroads. Says Daniel Monighan, chairman and president of Van Dresser Corp., "When the Japanese have not made prior commitments to Japanese suppliers (which has happened), we are very successful in selling to them. We license our technology to three Japanese companies, including the two largest companies in Japan."

Have you tried to sell to a Japanese assembly plant located in the US?

	Yes	No
Mfg./Prod.	71%	29%
Parts/Components	80%	20%
Materials	92%	8%
Total	84%	16%

Gene Stohler, VP of sales and marketing at ITT Automotive, notes, "The only success to date is through joint-ventures with Japanese companies." Says a major materials supplier, "You must have a Japanese partner if you want to do business."

Despite recent information printed in ***AI*** (*see September issue, p. 88*) about the difficulties US steel companies have in selling to Japanese automakers, steel and plastics manufacturers are having better luck at supplying the transplants than are the parts and components and production equipment suppliers. According to our survey results, about 26% of the materials suppliers are supplying Japanese transplants, among them steel, aluminum, glass and plastics suppliers. One steel company says it "currently sells successfully to several" Japanese assembly plants located in the US; an aluminum manufacturer claims success with Nissan and Honda. Says a major US plastics supplier's VP of sales and marketing, "We currently supply Nissan and NUMMI;" while yet another plastics supplier claims the Japanese "are more willing to pay for quality than the US companies." A top glass manufacturer's manager of automotive OEM development says his company sells to Honda and will supply Mazda's Flat Rock, MI plant.

Across the board results show that 84% of the US suppliers have tried or are trying to sell to the Japanese automakers. The frustration is apparent, but the willingness to get a foot in the door is paramount. Summing up this toe-in approach is the VP of planning and administration at a materials manufacturer: "We're looking for a good strategy to break down their [Japanese transplant's] determined preference for Japanese suppliers."

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2/24/87

CHILTON'S
AUTOMOTIVE INDUSTRIES
SINCE 1895

FEBRUARY 1987

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MAN OF THE YEAR 1987

Father of the Taurus: Lewis Veraldi

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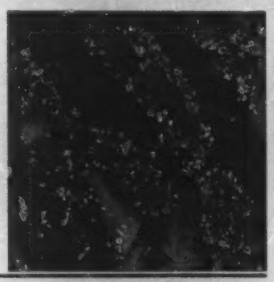
CHILTON'S AUTOMOTIVE INDUSTRIES SINCE 1880



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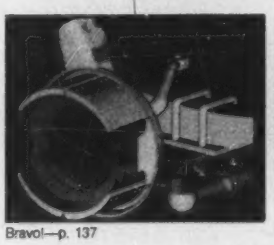

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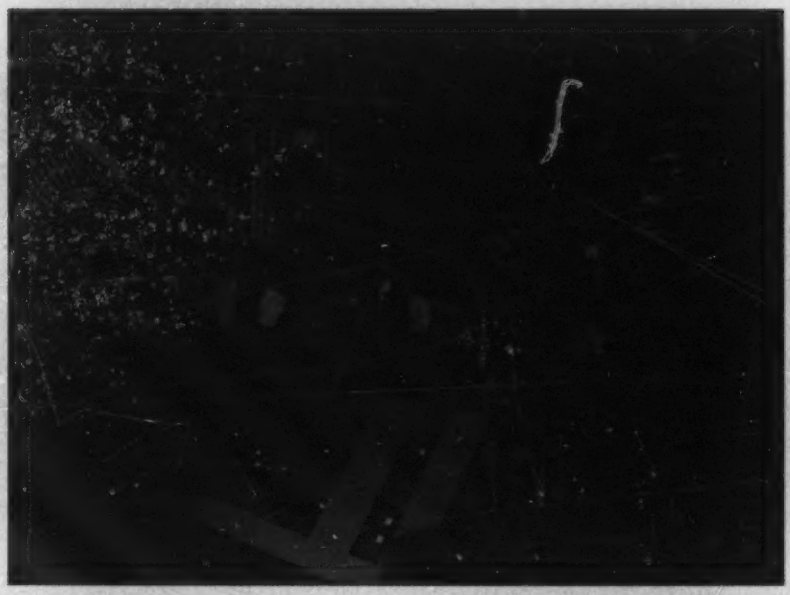
SAGAS OF SUCCESS: MAKING JUST-IN-TIME WORK

For those in the US auto industry who use it as a manufacturing system, just-in-time is paying big dividends.

by Bryan Berry

US automakers finally are waking up to the enormous potential of just-in-time (JIT) manufacturing. Not just a way of reducing inventory, JIT manufacturing is radically altering the automakers' production quality, scheduling, batch size, transportation, communications, and containers. At its best, JIT is linking automakers' and suppliers' plants as though they were one.

US automakers have a long way to go before they match the efficiencies of JIT manufacturing in Japan. Toyota's cost of automotive inventory per vehicle averaged $46 from 1980 to 1985 (*see table*). GM's was $581—a whopping $535 higher!



Seat supplier Hoover Universal prints bar-coded labels for its seats, which it ships JIT. Hoover's assembly plants turn over inventory 40 times a year.

Progress So Far

Still, GM cut total inventory by $5 billion from 1981 to late 1986, according to Leonard J. Ricard, GM's director of production control. The No. 1 automaker had $10 billion in inventory in 1981. General Motors' production has increased by 35% since 1981, so its inventory then would have totaled $14.5 billion at today's volume. Now the company has $9.5 billion in inventory, including about $5.4 billion in material, work-in-process, and supplies.

Turnover at GM's assembly plants has increased from 18 turns a year in 1981 to about 31 today. GM assembly plants in Michigan, where the supply base is centered, have raised inventory turns from 20 to 55 over the same time. A turnover occurs each time all the products in the plant are used, shipped out the door, and replaced by a new set of products.

Leading the pack are the plants at Buick City (Flint), Pontiac (Fiero), and Willow Run, all of which turn over inventory 70 times a year or more. Buick City is aiming at 100 annual turns.

Ford and Chrysler are making similar progress. Chrysler's assembly plants receive $25 million, or 50%, of its parts just-in-time. "We can increase that to 80% in this decade," predicts Richard E. Dauch, Chrysler's executive VP of manufacturing.

Chrysler's Sterling Heights, MI plant averages 70 turns a year. Daily JIT shipments there total $5 million in value; to Windsor, Ont., $5.5 million; and will reach $6 million at Dodge City (Warren, MI) this year.

These plants use in-line sequencing, which means the vehicles stay in the same order on the line throughout the entire assembly process. They're never taken off the line; even repairs and rework are done on-line. For the system to work, Chrysler must receive good parts on time.

"For our assembly plants to use 100% in-line sequencing, 70-80% of the parts must be delivered just-in-time daily," says Dauch.

Now Detroit's big challenge is to use JIT manufacturing not just at the assembly plants but at the fabricating plants as well. Annual turns at both fabricating and assembly plants average 11 at GM and Ford and 14 at Chrysler. That's much lower than the nearly 100 turns at Japanese automakers, including 135 turns at Toyota's assembly plants.

Detroit's drive toward JIT manu-

facturing already has achieved some remarkable efficiencies and erased some woeful inefficiencies. Automakers building seats used to store some 20 days' worth of foam in their assembly plants. Now the supply chain stockpiles 1 1/4 days' worth at most.

In one stunning improvement, a plant at GM's Inland Div. slashed production time for brake hoses from three months to three minutes. The plant used to allow lengthy delays and stockpiles between the departments that cut the hose to length, assemble the fittings, and pressure-test the finished hoses. Now those operations are done in sequence without delay. They're done right next to one another, with no stockpile of parts between the processes.

Getting In Synch

The ultimate in JIT manufacturing is when the supplier makes and ships the parts in the same sequence as the assembler installs them. That's happening today at plants supplying seats, strut assemblies, door trim, carpeting, instrument clusters, and wiring harnesses. For example:

- GM's Delco Div. plant at Livonia, MI make 120 types of struts in sequence for B-O-C Willow Run.
- J.P. Stevens' Michigan plant ships carpeting in sequence to the GM plants at Buick City and Detroit/Hamtramck.
- Oakley Co. mounts, balances, and inflates tire-and-wheel subassemblies in sequence for the Fiero plant.
- GM's AC Spark Plug Div. ships 300 varieties of instrument clusters to Buick City in sequence.
- GM's Detroit/Hamtramck plant receives 1700 parts numbers in sequence, including seats (from Windsor Trim), carpets, front suspensions, seat belts, and door trim. In all, the plant get 90% of its parts (by dollar value) just-in-time.

JIT manufacturing has swept the seat-making industry. Lear-Siegler, Windsor Trim, Douglas & Lomason, Findlay Industries, and Hoover Universal all ship just-in-time, often in sequence, to domestic plants.

Intake manifolds from CMI-Southfield are shipped in plastic pallets molded to the shape of the part to increase J-I-T efficiency.

Hoover Universal has eight plants dedicated to making and delivering seats in sequence to assembly plants not more than 50 mi (*80 km*) away. These include NUMMI; Nissan at Smyrna, TN; GM at Baltimore, Pontiac, Fort Wayne, and Shreveport, LA; and Chrysler at Sterling Heights. Hoover presently is building three more plants dedicated to the Saturn Corp. at Spring Hill, TN; American Motors at Brampton, Ont.; and Chrysler at Belvidere, IL.

Hoover's JIT assembly plants turn over inventory 40 times a year; its component plants, about 18. "The most inventory we keep at a plant is a day's worth. We don't like to do that," said R. Eugene Goodson, group VP and general manager of Johnson Controls' automotive systems group (Hoover's new name).

Automakers greatly aid JIT manufacturing when they fix production schedules as far in advance as possible. They used to stabilize schedules only two or three days in advance. Now some plants are fixing schedules five and even ten days before production. Last year Chrysler began generating fixed ten-day "supplier delivery schedules" (SDS) at its assembly plants in Sterling Heights, Dodge City, Windsor, and Belvidere.

"All our assembly plants will use 10-day SDS by the end of the 1987 model year," said Andrew R. Pollack, director of Chrysler's production programming and scheduling. "Ten days exceeds the production cycle times of most of our suppliers. With 10-day SDS, there's no supplier anywhere in the US who shouldn't be able to supply us just-in-time."

Enter Heijunka

Coordinating JIT manufacturing is toughest when the supplier and automaker are thousands of miles apart. But NUMMI is receiving parts at its

Japanese Inventory Costs: Still Lower Than US

	Cost of inventory per vehicle					Material, work-in-process, and supplies in 1985 (millions)	Worldwide Sales in 1985 (thousands of units)
	1981	1982	1983	1984	1985		
GM:	628	568	519	612	577	$5368	9305
Ford:	528	493	459	406	442	$2491	5634
Chrysler:	663	551	593	526	430	$927	2157
Toyota:	43	44	49	53	42	$154	3694
Nissan:	95	81	82	84	117	$307	2634

Source: Annual Reports

Note: All figures are computed by the last-in, first-out (LIFO) method, except Chrysler's figures for 1981, '82 and '83, which were computed by the first-in, first-out (FIFO) method; and all of Toyota's inventories of work-in-progress and supplies and Nissan's work-in-process, which were computed by the average cost method.

California site just-in-time even though most of its suppliers are in Japan or the American Midwest.

NUMMI places orders with its Japanese suppliers by satellite daily. Parts are consolidated at Kamigo Center in Japan. Three ships carrying parts for NUMMI arrive at the docks at Oakland, CA, every week.

Trucks owned by Leaseway Corp. pick up parts for NUMMI from 17 suppliers in the Midwest and consolidate them in Detroit and Chicago. The parts in Detroit are trucked to Chicago. Every day ten railroad car loads of parts, including such bulky items as bumpers from GM Guide, go from Chicago to the NUMMI plant at Fremont, CA.

NUMMI's suppliers don't deliver large shipments of the same-type parts. Instead, they maintain a balanced mix of different types of parts.

This is heijunka, which NUMMI manufacturing VP Kosuke Ikebuchi defines as "the overall averaging in the production schedule of the variety and volume of items produced in a given time period."

US automakers are using daily "milk runs" of trucks that carry parts from two or more suppliers from distant points in the nation. Chrysler receives 41 milk runs daily.

The longest is from El Paso, TX. There the truck picks up seat belts from American Safety Co. and wiring from both a Chrysler division and United Technologies' Essex Div. The truck stops in Fort Worth to pick up cruise control components from Specific Cruise Co.

After a 56-hour journey, the truck unloads these parts at Chrysler's Detroit-area plants. The assembly plants carry only a 6-8 hour inventory of these parts, so they're used the very same day they arrive from Texas.

GM and Ford also are expanding their dedicated transportation networks. All GM assembly plants will receive milk runs by early this year.

These dedicated trucking runs have enabled GM to close a large warehouse in the Detroit suburb of Westland, MI. For the past 15 years, trucks delivered about 8000 different low-value parts such as nuts, bolts, and brackets to the warehouse. From Westland railroad cars carried these items to GM assembly plants in Van Nuys, CA; Shreveport, LA; Baltimore; Doraville, GA, and elsewhere across the nation. Now the trucks, not the warehouse, consolidate these different parts and deliver them to GM's far-flung plants.

The Goal: Zero Inventory

JIT manufacturing is causing changes in the containers used to transport parts. Automakers are beginning to use plastic pallets molded to the shape of the parts, so the parts don't slide around. Once delivered, the empty pallets can then be nested inside one another for more efficient return shipment.

In one ingenious application of JIT, CMI-Southfield (MI) ships three truckloads of pallets loaded with intake manifolds every night to C-P-C's engine plant at Tonawanda, NY. Since only one truck is needed to bring the empty nested pallets back to Southfield, the company sends the other two trucks to Wabash, IN. There they pick up aluminum castings from CMI's foundry and transport them to the Southfield machining plant.

General Motors is requiring all its suppliers to be linked electronically with its plants; most are. GM asks its suppliers to use the electronic specs developed by the Automotive Industry Action Group (AIAG).

C-P-C also requires suppliers to affix bar-coded labels to containers. However, it may allow small suppliers to use pre-printed labels.

"We have brought our whole supplier community into our assembly process," said Chrysler's Pollack. "Our ultimate goal is to have all parts manufactured and delivered as if they were an integral part of the assembly operation. Our goal is zero inventory." AI

Bryan Berry is Detroit Editor for Chilton's Iron Age magazine.

WATCH OUT, KOREA: HERE COME THE BRAZILIANS!

After years of promising potential, Brazil may be about to reach the critical mass it needs to become an automotive force majeur.

by Paul Eisenstein

Brazil's explosion onto the global automotive battlefield has been suffering from fizzling fuses for years. Now it finally looks as though the big bang is going to take place. It's been a long time coming.

It's an embarrassment for a country with Brazil's low-cost potential and well-developed auto industry to have been beaten to the US market by upstarts such as Korea, Taiwan and Yugoslavia.

The much-touted comparisons of Brazil to Korea are particularly ironic when you delve below the chest-thumping. Korea had no domestic auto industry or market to speak of five years ago, and the car industry it has now resulted from massive transfers of Japanese and German technology. Far from being the self-creation of a modern industrial destiny, Korea's auto industry spontaneously erupted from a pile of joint-ventures and equity papers.

Brazil, on the other hand, has a strong home market, and it's on this strength that the country lays claim to being the world's tenth-largest motor vehicle producer. It has been exporting vehicles to Africa and Europe for several years now, and it's rapidly approaching the first hurdle—the race to enter the tough and highly lucrative American market.

Ford do Brasil assembly line at Sao Bernardo. Cars are the popular Del Rey.

All The Way—To the USA

Volkswagen United States, of course, just began importing the Fox, a $5700 subcompact with which it hopes to recapture a share of the low-end market segment it effectively abandoned in the 1970s when it dropped the Beetle (see *Jan. '87 AI, p.52*). But the Beetle was imported from West Germany; the Fox is being built in Brazil.

"Brazil is the next major auto producing country," insists Stephen Scharf, who recently retired from the Chrysler Corp. where he was in charge of developing an international import and manufacturing strategy. "That country provides a tremendous opportunity, and any company that avoids Brazil is stupid," he says emphatically. Like the developing Southeast Asian carmakers, Brazil's auto labor rates are extremely low—barely 10% of US union wages. But unlike the South Koreans and Taiwanese, Brazil has a well-developed automotive infrastructure, producing in the neighborhood of 99% of the components used in its assembly lines. The Latin nation also has the advantage of a tremendous supply of raw materials.

Not only do the carmakers operate their own component plants, but so do some of the best-known American and European auto suppliers, including Bendix, Cummins, Eaton and Rockwell. That is the result of highly restrictive government domestic content legislation, which has also encouraged carmakers in that country to export whenever possible. While Volkswagen is the first to bring fully-assembled cars to the US, Brazil has been supplying the American auto industry with components for quite a few years.

The Trek Up North

Ford's Brazilian operations, of course, ship the Cargo-series truck,

Brazil's automotive infrastructure is already in place. Shown is Ford's Tatui proving ground.

Volkswagen's new US-market Fox: A Brazilian litmus test?

Brazil Pass. Car Sales

(Through Sept. '86)

1974	691,000
1979	864,000 (All-time Peak)
1980	619,000
1981	459,000
1982	570,000
1983	621,000
1984	547,000
1985	614,000
1986	544,000 (Up 27%)

an in-line diesel for large trucks, car radios, and the 2.3-L ohc engines for the Ford Thunderbird, Merkur and Ranger.

General Motors imports the 2.0-L ohc four used in several J-car models. According to GM spokesman George Schreck, "We average at least 15,000 units every month."

VW do Brasil also shipped engines to the US in 1981 for the Rabbit; however, those operations were later shifted to Mexico. One of VW's Brazilian plants, commercial vehicle operation, will begin exporting some heavy trucks to Paccar this year for sale under Paccar labels (Paccar manufactures Kenworth and Peterbilt).

Meanwhile, Brazil's 1500 automotive component manufacturers, many owned by American manufacturers, are also making inroads into the United States. Their exports more than doubled between 1982 and 1985, though they still account for a modest 4% of all imported US auto parts. Officially, shipments were expected to total around $600 million in 1986, though that figure is believed to be artificially low because importers of Brazilian parts usually buy from their own subsidiaries there.

All signs indicate Brazilian export volume to the US will be increasing in the near future. Chrysler Motors chairman Gerald Greenwald says, "We're looking very seriously at Brazil. We recently signed an agreement with the government for a major export program out of Brazil. We're developing an increasing number of long-term relationships with suppliers in Brazil."

Greenwald says these focus "on components, not vehicles;" however, there is evidence that Chrysler, which has been discussing various business relationships with Italian carmaker Fiat SpA, may be interested in importing the Uno, a mini-compact built at Fiat's Brazilian factories.

Clearly, any such program would win the blessing of the Brazilian government, Greenwald says: "They owe $100 million—they're one of the world's great debtor nations. They've got to export to pay the debt."

Brazil Car Market Share

(Through Sept. '86)

Year	VW	GM	Ford	Fiat
1974	57%	19%	19%	0%
1979	54.5	18	15	12
1980	51	21	15	13
1981	47	24	19	10
1982	46	26	17	10
1983	42	27	19	11
1984	43	27	20	10
1985	40	27	20	13
1986	43	26	19	13

Capacity Aplenty!

And Brazil has the industrial base to meet growing demand. Because of the economic, social and political uncertainty in the Latin American nation's recent past, its domestic car sales have fluctuated wildly: from a high of 864,000 passenger cars in 1979, to a low of 459,000 two years later. Sales have been rising in recent years, and reached 544,000 during the first nine months of 1986.

But that still leaves sizable unused capacity in both component and assembly plants. GM's 1985 Brazilian car and truck sales totaled 191,000. Capacity at its two assembly lines is currently 261,000. The automaker had planned a five-year expansion program, though that has been cut back for a variety of reasons, including General Motors' financial prob-

Alcohol fuel experience may be Brazil's ace-in-the-hole.

VW do Brasil builds the chassis/cab of PACCAR's new Class 7 MidRanger; it utilizes powertrain, axles, brakes, tires from US suppliers.

lems in the US.

Even without adding extra capacity, GM is the second largest automaker in Brazil, with 26% of the passenger car market in 1985. The largest is VW, with 43%. Ford held a 19% share, and Fiat 13%. Ford is the largest truck manufacturer, with a 1985 market share of 28%. Number two is Volkswagen, with 20% and GM and Mercedes are tied with 18%. The rest is divided up among several manufacturers, including Fiat, Saab-Scania and Toyota.

It is interesting to note that while Toyota does supply a small number of trucks, the Brazilian vehicle market is essentially owned by European and American manufacturers, in stark contrast to the situation in Southeast Asia.

"The local content requirements are so high as to be virtually intolerable to the Japanese," auto analyst Maryann Keller says.

Does all this mean the Brazilians can count on making steady inroads into the United States? Not at all.

AutoLatina

There clearly remains much concern about the potential for social and political instability in the country, as well as concern about negative economic developments.

For years, Brazil was wracked by inflation measuring hundreds of percent annually. More recently, a currency change and wage-and-price controls have brought this runaway spiral under control, but these moves have also hurt many Brazilian manufacturers, who say they have not been able to recoup in higher prices the cost of recent wage hikes authorized by the government.

VW, for example, posted a $38.5 million loss on its Volkswagen do Brasil subsidiary in 1985. Ford also lost money on its Brazilian subsidiary, prompting the two carmakers to launch a joint-venture uniting their Brazilian and Argentine facilities as part of the new AutoLatina. Volkswagen will become the dominant partner in the arrangement, with a 51% holding.

"The main objectives of the venture would be to ensure continual updating of technology, higher operating efficiencies and better use of manufacturing facilities," notes Ford president Red Poling.

Together, VW and Ford have 15 industrial plants in the two countries, with the capacity to produce 900,000 cars and trucks a year. They employ 75,000 people, and through their 1500 dealers, last year's sales totaled $4 billion.

Brazil's Secret Weapon

It is unclear at this point exactly how AutoLatina will ultimately affect the international plans the two carmakers have been developing for their Brazilian component and assembly lines.

That is likely to depend on a variety of external factors. For beyond financial considerations, there is also one of image. The South Koreans have been able to catch a ride on the coattails of the Japanese, with their reputation for quality and value.

But all the Koreans have contributed to the world automotive industry so far are low wages and a certain business aggressiveness. Japan, once an up-and-coming newcomer itself, contributed that and a whole new concept of manufacturing technology which enabled it to gain an advantage no other country has yet matched. If all Korea has to offer is decent quality and low costs, then it's going to have to keep a worried eye looking over its shoulder as other competitors jump into the market.

Therein may lie Brazil's ultimate advantage. Sure, Brazil has a well-developed auto industry, low wages and a big home market. But it has more than that.

It is the only country in the world that mandates the use of engines which can run on ethanol. As such, it has the biggest and best technological base for alchohol fuels. And as virtually all energy experts in the industry point to alchohol as the fuel of the future, Brazil may may well have the trump card it needs to nose out other Third World competitors as we look towards the 21st century. AT

AUTOMAKER QUARTERLY REPORT

Final '86 tallies show the affect of transplants on the domestic market, strength at Ford and Chrysler and optimism for AMC in '87.

by Tom O'Grady

While 1986 broke sales records, increased competition from imports held sales of North American-built cars down at the 1985 level of 8.2 million units. Because transplants (foreign vehicles built in the US) increased from 410,000 to 605,000 units, total traditional domestics experienced a declining market in a record year.

It was a year of contrasts. GM, whose losses accounted for almost the entire picture, saw sales decline from 56.2 to 55.2% of the domestic market and dip below 50% during the last two months of 1986. Ford lost one-tenth of a percent, but was extremely strong at year's end. Chrysler was the exception: It gained four-tenths of a percent, for 14.3% of the market.

AMC's tough year ended positively, with Chrysler leasing part of the Kenosha plant. We are still concerned with the company's wide future product mix and its ability to change its image, but reports of significantly improved quality are beginning to surface. New models look very favorable. If the right ingredients are mixed in the right order, AMC might nearly break even in 1987.

For GM, 1987 is expected to be a tougher year than '86. Plant cutbacks and layoffs will produce cost savings, but the continuing decline in sales will have the most effect. The introduction of the new W-cars and some redesigns on E- and K-cars will be anxiously awaited. Ford and Chrysler can also expect a slight decline in earnings, as a result of new product launches rather than from loss of sales.

Honda's plans for 1987 include increased production at Marysville, OH, which will mean greater efficiency and higher sales. We expect Subaru to be successful in reducing costs this year, and to sell its entire allotment of vehicles from Japan. AT

WHAT'S HOT! Domestic Auto Sales (4th Quarter Results)

Carline	'86	'85	% Change
Celebrity	408,946	363,619	12.5%
Escort	402,181	420,690	(4.4%)
Cavalier	357,120	431,031	(17%)
Ciera	329,930	333,585	(1.1%)
Accord*	325,004	268,420	21.8%
Tempo	265,382	281,144	(5.6%)
Taurus	263,450	4056	6395%
Olds 88	261,260	188,129	38.8%
Century	240,747	234,508	2.66%
Honda Civic	235,801	208,031	13.3%

*—Includes imports
( )—Negative value

Domestic Light Truck Quarterly Production

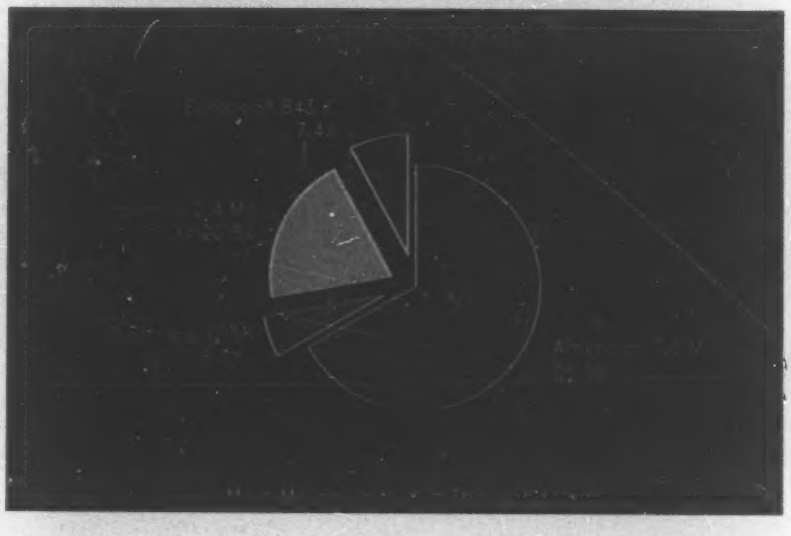
Truckline	2-'86	3-'86	4-'86
Chrysler Vans	29,344	19,651	32,313
Sport Utility	6663	6,441	6830
....Minivagon	77,051	56,811	69,844
Lt Conventional	34,370	48,812	64,215
Ford Aerostar	45,827	41,142	41,153
.....Bronco	15,407	10,322	10,322
.....Econoline	62,902	45,957	58,079
.....Ranger	86,950	73,124	76,441
.....Bronco II	31,862	25,081	30,648
.....Light Conv.	177,432	146,735	98,750
Chevy..Blazer	7834	6352	7255
.....Suburban	17,450	13,582	12,257
.....P-Model	13,141	7608	7846
.....S-10	61,889	66,846	48,650
.....Blazer S	42,389	42,977	33,445
.....Astro	42,127	39,270	38,114
.....Van	43,383	27,386	24,165
Light Conventional	114,224	89,385	76,470
.....Sierra	--	--	1531
GMC..Jimmy	2179	2263	2453
....Suburban	6398	5989	7083
.....P-Model	1508	1135	1861
.....S-15	16,834	16,646	12,759
.....Jimmy S	11,539	12,053	10,287
.....Safari	10,394	9632	9664
.....Van	14,956	8069	8360
Light Conventional	39,658	30,213	26051
.....Sierra	--	--	610
Nissan.Pkup	46,222	23,135	20,228

US Passenger Car Market Shares To Date

Manufacturer	Sales	% Total
General Motors	4,693,161	41.06%
Ford	2,080,822	18.21%
Chrysler	1,308,991	11.45%
Honda/Acura	693,515	6.07%
Toyota	641,087	5.61%
Nissan	546,151	4.78%
VW	204,561	1.79%
Subaru	179,100	1.57%
AMC/Renault	77,005	0.67%

Thomas O'Grady heads Integrated Automotive Resources, Inc. in Wayne, PA. (215) 647-6978.

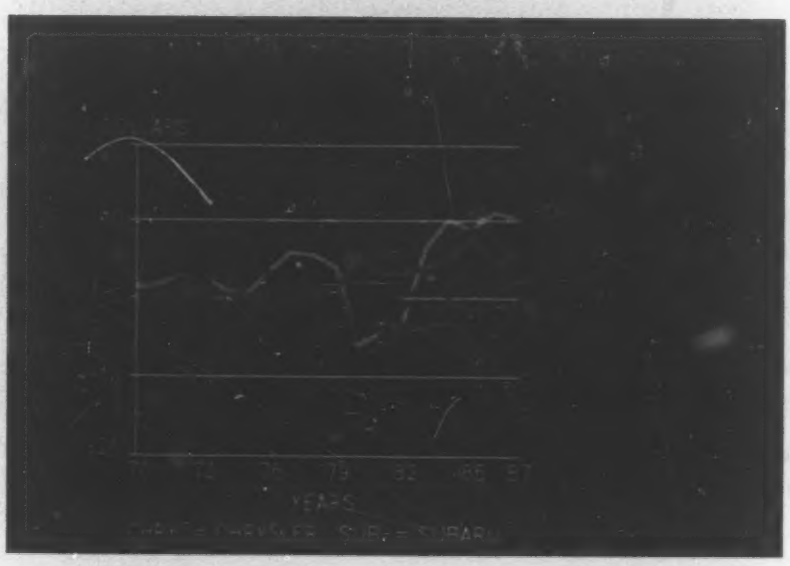
FINANCIAL SNAPSHOT



Passenger Car Market Share By Geographic Base

Manufacturers	Total Sales	Total Market Share
American	7,609,500	66.58%
Japanese	2,371,676	20.75%
European	843,332	7.38%
US Built Imports (VWoA, Honda, NUMMI, Nissan, Renault)	605,163	5.29%
Total	**11,429,671**	**100.00%**

Stock Earnings



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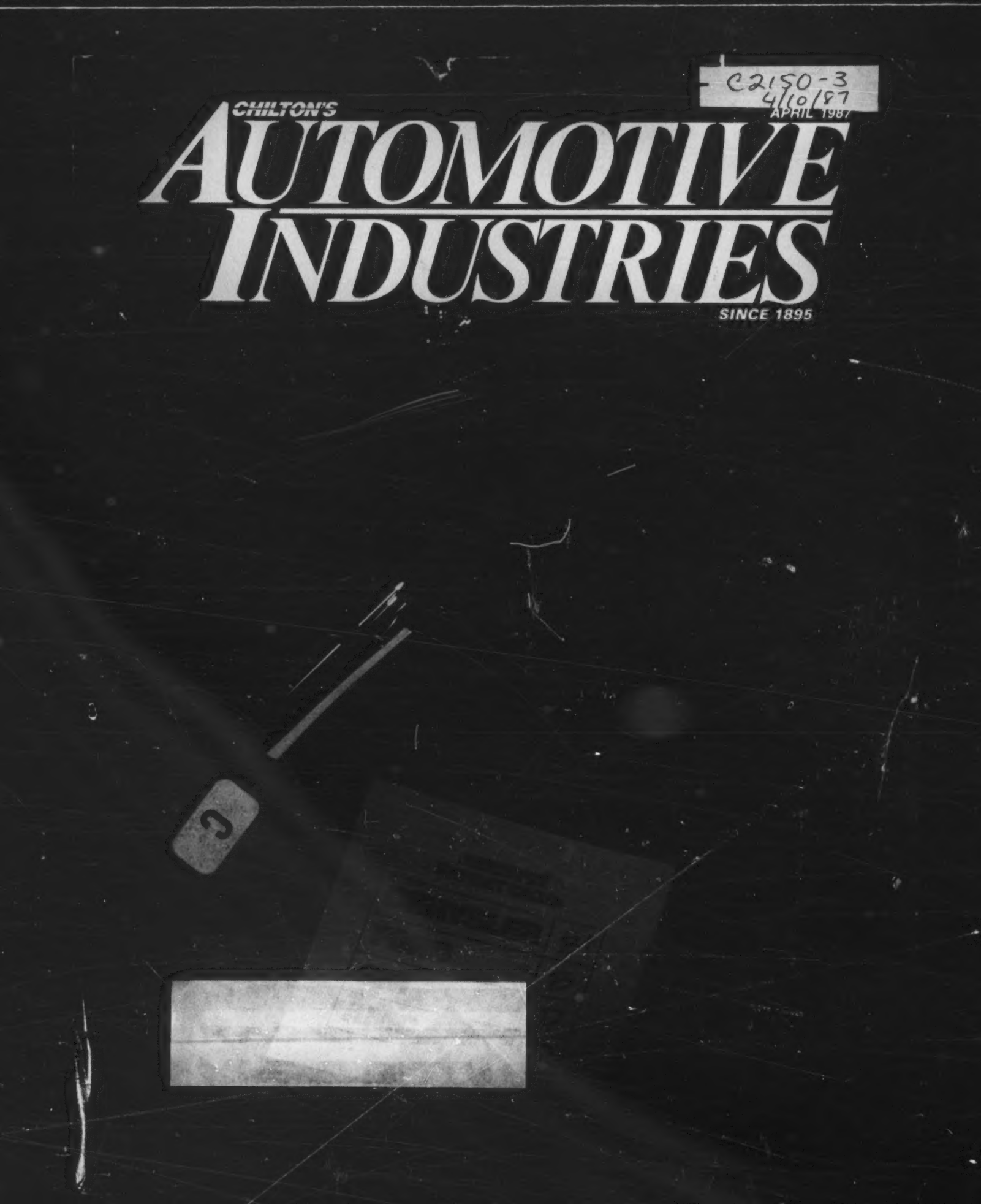
APRIL 1987

SINCE 1895



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1986 INDUSTRY REPORT CARD

AI's exclusive look at billions of dollars and millions of vehicles.

by John McElroy

It was the best of times, and the not-so-best of times. When the books were closed and all the numbers added up, 1986 turned out to be the best sales year for cars and trucks in the American market. There were 16.3 million vehicles sold in the US last year, including 11.4 million cars and 4.9 million trucks. (Remember back in 1982 when only 10.5 million vehicles were sold and everyone said the market would never come back?)

But sales records aside, it turns out that the American car companies actually sold more cars in 1964 than they did last year. And though it was the third best year for truck sales, 1986 also represents the first time that 1 million foreign trucks were sold in the US market, more than twice the 1980 total. So to put the sales records in perspective and turn to more objective yardsticks to measure domestic automaker performance, ***AI*** presents the 1986 Industry Report Card.

Our faithful readers will remember how each company is graded. First we dig through several years of annual reports to develop trend lines for specific categories. Then we grade each company according to these trend lines, with particular emphasis on the most recent results. What we're looking for is whether a company is improving, going nowhere, or starting to sink. We don't compare one company to another. We compare it against its own efforts. And to put everything in perspective, we also include some data from foreign manufacturers to establish who is the world-class leader of each category.

Chrysler earns an "A" in '86 product quality, fields new LeBaron for '87.

Chrysler: Best in Class

For the second year in a row, Chrysler has come out at the top of the class. The Pentastar people are running one very well-oiled machine, and they made big improvements across the board. In the Quality category, which is based on J.D. Power's Customer Satisfaction Index, it took a big step forward and earned an "A". Coincidently, Chrysler's improvements in the Productivity and Inventory Turns categories are factors that would also have a positive impact on quality, which reinforces the fact that their improvement here is no fluke.

On the face of it, the "A" we awarded Chrysler for Profit-per-Unit may seem out of place. The numbers suggest Chrysler has slipped in the last three years. But you have to remember that the company paid no taxes in 1984, and didn't carry a full tax load in 1985, either. Keeping that in mind, their Profit-per-Unit of $1057 in 1986 actually represents an

CHRYSLER

CATEGORY	1973	1978	1984	1985	1986	GRADE
Quality	–	–	90.3	77.3	89.6	A
Profit/Unit	$131	($129)	$1210	$1080	$1057	A-
US Market Share	15.6%	11.2%	11.9%	11.8%	11.7%	B-
Return On Sales	2.1%	(1.5%)	12.1%	7.7%	6.2%	C
Productivity	13.0	13.0	18.1	17.0	19.8	A+
Inventory Turns	5.6	6.3	14.5	18.8	22.1	A+

OVERALL GRADE—B+

Ford's Taurus: The big gamble has paid off handsomely.

improvement and proves that it is by far the low cost producers amongst the domestic automakers.

Chrysler has also seen its market share slip in the last three years. But we still gave them a "B" for their performance. Why? Because anyone who could just hold their own in the dogfight that took place last year did very well indeed. And remember that Chrysler had to shut down its Warren, MI truck plant for three months as part of its conversion to Dodge City. If not for that, the company probably would not have lost any market share. Its acquisition of AMC should increase Chrysler's total market share about three percent in next year's Report Card.

It was the company's "C" in Return on Sales that prevented it from getting an overall "A" grade average. Though sales increased $1.3 billion compared to 1985, costs increased $1.5 billion. Presumably, this slight decrease in efficiency is related to the cost of low-rate financing the company offered throughout most of 1986.

The last two categories—Productivity and Inventory Turns—are where Chrysler really came through with flying colors, earning an "A+" in each one. We measure productivity as the number of vehicles built per employee per year. Not only did Chrysler make major improvements here, it actually has the best productivity of any American automaker, with nearly 20 cars per employee per year. But Toyota—including unconsolidated subsidiaries—holds the world-class title for productivity with a total of *45* cars per employee per year.

The same goes for Inventory Turns, which is a measure of a company's application of just-in-time (JIT) production. The more turns, the less inventory—and as anyone in manufacturing will tell you, that has a very positive impact on quality. Chrysler rates the best of all American automakers with more than 22 turns, but Toyota holds the record with *125* turns!

Ford: Routine Improvement

When it comes to Quality, the star student in *AI*'s Industry Report Card is the Ford Motor Company. But remember, we're grading each company compared to how it did in years past, not how

MAKING THE GRADE

FORD

CATEGORY	1973	1978	1984	1985	1986	GRADE
Quality	–	–	113.6	95.3	104.5	A
Profit/Unit	$273	$424	$755	$644	$847	A+
US Market Share	29.8%	26.5%	22.7%	20.3%	21.2%	A+
Return On Sales	3.9%	3.7%	5.5%	4.7%	5.3%	C
Productivity	13.7	13.7	15.6	16.4	16.8	B
Inventory Turns	5.3	6.5	14.5	14.8	13.8	D

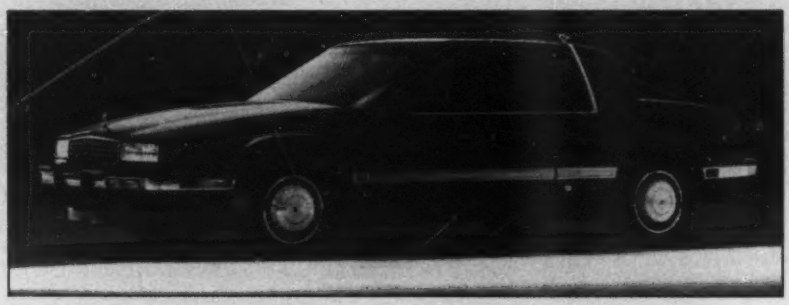
OVERALL GRADE—B

it compared to others. And though Ford still hasn't matched the score it achieved in 1984, it made such a quantum leap forward in 1986 with its score of 104.5 that we awarded the company an "A". But the overall winner here is Honda, which tops Power's CSI list with a score of 132.

Ford's Profit-per-Unit increased so dramatically that if the company applies its policy of continuous improvement to this category, it's going to catch Chrysler by this time next year. And you have to remember Ford achieved this on a worldwide basis, which includes markets that are probably not very profitable at all. Naturally, such a stellar improvement earned it an "A+".

The same goes for Ford's increase in market share. At a time when nobody but the imports seem to be increasing market share, it comes as a welcome change to see a domestic automaker do so well. Plus, Ford should be able to increase its market share by three percentage points in the next few years with the Mexican Tracer, Korean Festiva, European Scorpio and Flat Rock-built Mustang. In the meantime, Ford is capacity constrained—it sold every car and truck it could build. No doubt about it, the public really likes what Ford has to offer and that's the best stamp of approval any company could hope for.

But when it comes to Return on Sales, Ford doesn't seem to be making much headway. The company may have taken in more money than it ever has before—enough, in fact, to award each of its UAW workers $2100 each, but it also saw its costs increase more than ever before. That's why we gave it a "C".



Lackadaisical sales of GM's E- and K-bodies have hurt the General.

The company's policy of continuous improvement served it well in the category of Productivity, but frankly, we were surprised not to see a more dramatic improvement. With its plants operating at capacity, one would have expected the kind of increase that Chrysler achieved. The same goes for Inventory Turns. With its plants running full-out, Ford should be able to stabilize its production schedule which is a key requisite for JIT. Instead, it appears that Ford is allowing its inventory levels to pile up again, a policy that could get it into trouble if not remedied.

GM: Bad News Bears

Reflecting the problems that have afflicted it lately, GM slipped dangerously from the overall "C+" it earned last year, to a "D" this time around. Worse still, we don't see anything changing at the giant automaker that will improve its fortunes soon. At this point in time we would have expected to see the company's reorganization have a positive impact on productivity, or to see the acquisition of EDS produce efficiencies that would flow to the bottom line. This clearly hasn't happened.

GM's Quality rating has really gone nowhere in the last three years, and the fact that its Productivity and Inventory Turns haven't improved either helps explain this stagnation. But it's the poor performance of GM's financial figures that are truly shocking. The trends in the Profit-per-Unit and Return on Sales categories don't bode well for the future. Nor, for that matter, does the corporation's loss in Market Share. Low finance rates of 2.9% that were used to move slow-selling models throughout the year must have cost GM a bundle. Will the corporation's 6 year/60,000 mile warranty prove to be a big drain, too?

There's not much else to say about GM's performance. But when we look a little bit farther out, we hope the new Corsica/Beretta, GMT400 and GM10 programs will improve things in time for next year's Report Card.

GENERAL MOTORS

CATEGORY	1973	1978	1984	1985	1986	GRADE
Quality	–	–	91.2	92.6	92.4	C
Profit/Unit	$481	$667	$666	$466	$157	F
US Market Share	51.5%	47.3%	39.1%	40.3%	38.4%	F
Return On Sales	6.7%	5.5%	5.4%	4.1%	2.9%	F
Productivity	11.4	12.0	11.5	12.7	12.2	C
Inventory Turns	5.4	6.7	10.3	11.9	11.7	C

OVERALL GRADE—D

AMERICAN MOTORS

CATEGORY	1973	1978	1984	1985	1986	GRADE
Quality	–	–	51.5	65.0	86	A+
Profit/Unit	$147	$101	$35	($320)	($317)	F
US Market Share	3.5%	2.3%	2.8%	1.9%	1.7%	D
Return On Sales	4.3%	1.4%	.36%	(3.1%)	(2.6%)	D-
Productivity	18.2	17.1	18.1	14.7	13.3	F
Inventory Turns	7.2	6.4	15.5	15.6	15.3	C

OVERALL GRADE—D

American Motors: Not Failing!

American Motors Corporation

Perhaps the most astonishing aspect of AMC's performance is simply that the company is still hanging on. With such tenacity, perhaps AMC's president Joe Cappy should be referred to as Joe Scrappy.

As bad as AMC has done, it never earned an overall failing grade with the Industry Report Card, even though a "D" is nothing to feel good about. And now that AMC is going to be absorbed by Chrysler, you might even say that it hung on long enough to be rescued—again.

AMC's Jeep range should help bulge Chrysler's bottom line next year.

Measuring Up

The grades in this year's Report Card are a good measuring stick for assessing the competitive position of each company and how it will perform in 1987. Of course, this fall's contract talks between the UAW and Ford and General Motors could have a significant impact on either or both companies' performance.

So far, 1987 seems to shaping up as a soft sales year. Any company facing a strike that causes a significant loss in production is likely to lose market share that it may never regain. And any company that, in order to avoid a strike, caves in to high-wage demands from the union, including the 3% annual improvement factor (AIF), is likely to see its competitiveness dwindle in the long run.

If so, GM really has its work cut out for it.

Ford and Chrysler seem to be financially well-positioned to weather any storm. But they still have a way to go to match the companies at the head of the class in Quality, Productivity and Inventory Turns.

But as the Report Card shows, they're getting more competitive all the time. AI

Chilton's
TRUCK & OFF-HIGHWAY INDUSTRIES

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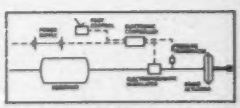

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June/July features the latest in electronics for trucks/heavy equipment.

Drawing Lines About Counting Trucks

by John Stark

There's a minor imbroglio brewing about changing the categories used to keep track of the US truck business.

Several OEMs are in favor of reclassifying commercial vehicles, as are some major suppliers. There's a negative, things-are-fine-as-they-are reaction from others.

Freightliner Corp., and its outspoken chairman and CEO Peter Rupp, are chief proponents of truck reclassification. They'd like to see a profound change in the method vehicles are classified "clean up" the industry's retail sales counting.

Overhaul of truck classification would enable vehicle producers and parts suppliers to more accurately plan annual plant capacity utilization, forecast future market trends, improve inventory management and offer the US government a better data base for making regulatory decisions are made, Rupp argues.

Medium and heavy-duty trucks are currently classified as Class 6, 7 or 8 vehicles according to gross vehicle weight. Class 6 falls in the 19,501-26,000 lb (*8833-11,800 kg*) category. Class 7 stands at 26,001-33,000 lb (*11800-15,000 kg*) and Class 8 represents units with 33,001 lb and over. Sales data is reported to the Motor Vehicle Manufacturers' Assn.

Last year, commercial truckmakers reported to the MVMA that they'd sold 44,532 Class 6 vehicles but unit registrations came in at 50,200—a 5668 truck differential. Class 7 truck sales stood at 100,278 vehicles compared to 86,700 registrations, a 13,578 truck difference.

Class 8 unit turnover amounted to 112,871 vehicles versus registrations of 114,575 trucks, a 1704 unit differential.

Rupp says the present method of classifying trucks "is archaic," noting that "some of the trucks could be classified as 7s or 8s," depending on producer preference.

Proper classification is important because the truckmaking industry—as well as the Eatons and Rockwells—plan future outlooks in terms of capacity, people, designs, etcetera.

John Stark is editor and publisher of Stark's Off-Highway Ledger.

"If the industry has refined data in Class 8 and found that up to 10,000-15,000 Class 7 trucks were included in Class 8, then reversed later, you don't get a consistency of data base," Rupp says, adding that current truck classification "is arbitrary, incomplete, obsolete and stinks." Shifting Class 7 trucks into Class 8 and vice versa "is sometimes done by manufacturers to kind of give a better picture of Class 7, if they're high; or of Class 8, if they're low," he explains.

Mack Trucks chairman and CEO Jack Curcio agrees that a change in classification methods is needed, but he's unsure what the replacement should be. At Ford Truck and Navistar International, the general feeling is that the current system is just fine. A company-by-company analysis of reported retail sales versus registration by type of truck shows the largest volume differentials occured at Ford and Navistar.

Rupp says discrepancies in the reporting of unit retail sales in the US truck business is "statistical dilemna. To show true trends in sales of class 6 versus 7 versus 8," he says, "you need accurate retail sales figures. The current sales figures have a lot of mystery in them. It gets refined when you get the registration figures. But the registration figures are 4 to 5 months late. In business, 4 to 5 months is a long time."

Rupp thinks that a new method should be devised by the SAE "as quickly as possible" to reclassify trucks, and then recommended to the US government. According to Rupp, Freightliner had conversations with SAE in the 1987 first quarter. "SAE is extremely interested in our suggestion," he reports. "I have high hopes that SAE will act."

Trucks could be differentiated by such things as weight, axle locations, fifth wheel, cab and chassis, he says. The current classification system, in Rupp's eyes, is not "a total and full disaster" when used for annual plans on capacity. But, he says, it makes meaningful analysis almost as bad as some of the government statistics. ■

US TRUCK REGISTRATIONS VS. RETAIL SALES

	1986 Registrations			1986 Retail Sales		
	Class 6	Class 7	Class8	Class 6	Class 7	Class 8
Ford	11,970	29,950	10,900	12,643	32,624	11,286
Freightliner	--	-17,400	--	-17,473		
General Motors	13,650	28,480	7440	14,199	29,024	7760
International	19,950	21,860	26,725	12,789	31,930	26,303
Kenworth	--	--	10,935	--	--	10,457
Mack	2285	2355	17,190	2623	2678	17,247
Mercedes-Benz	2010	1670	--	2087	1929	--
Peterbilt	--	--	10,175	--	--	9992
Volvo-White	--	1385	10,535	--	1459	11,361
Others	335	1000	3275	--	20	992
Total	50,200	86,700	114,575	44,532	100,278	112,871

CHILTON'S
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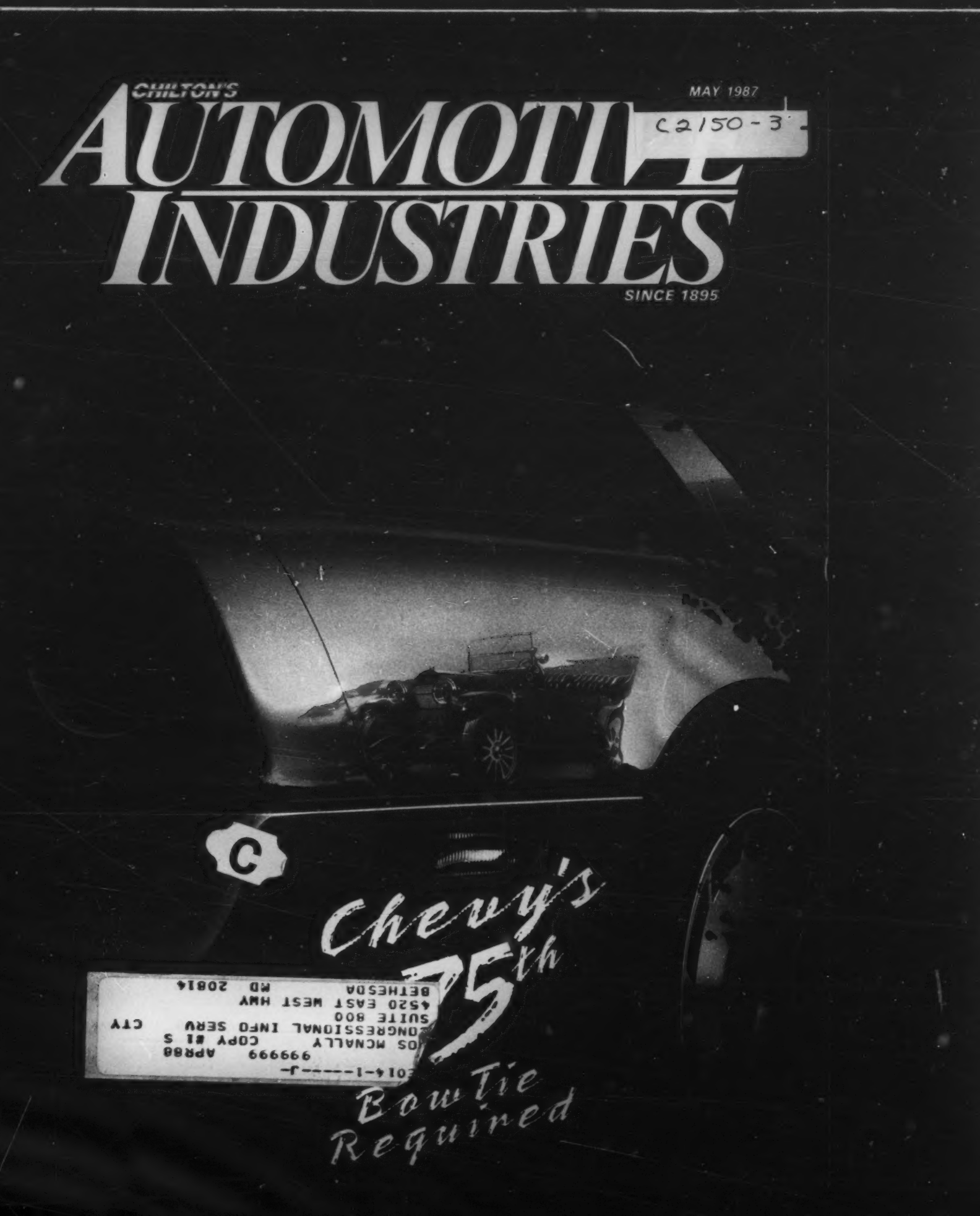

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AUTOMAKER QUARTERLY REPORT

First quarter '87 reveals the effects of cost-cutting at GM and a final hurrah for AMC as AMC. Meanwhile, Ford keeps reaching for the stars.

by Tom O'Grady

The remainder of 1987 will signal a turning point for much of the industry: Although the fall in the value of the dollar seems to be a burden to the imports and good news for the domestics, US sales will substantially drop and the domestic industry will restructure to some extent.

In response to heavy criticism GM is pushing for cuts in costs. Some of the GM plant closing costs were already written off in 1986, so expect a healthy 1987. The Corsica/Beretta will have a positive affect on GM's market share. GM's major move in the market will be the W-car, the mid-size replacement to be introduced next year.

Meanwhile, Ford is taking advantage of GM's delays in W-car production and pursuing the mid-size population with its successful Taurus/Sable. The company will continue to change as the Mazda plant at Flat Rock starts production and Ford imports cars from Mexico and Korea.

Thomas O'Grady heads Integrated Automotive Resources, Inc. in Wayne, Pennsylvania.

In 1987, Chrysler will be hampered in the short run by the acquisition of AMC, which will take impressive amounts of time and energy to assimilate. These problems will nonetheless cause some short-term observers to question the practicality of the acquisition. Yet the AMC products should bring more to Chrysler, particularly in the truck market.

Although it may seem inevitable that AMC was to disappear, it seems worthwhile to take note of its recent performance. AMC recently made solid progress in quality and new products (Premier and Medallion) and improved its bottom line.

Subaru continues to make progress and find ways to increase revenue while under the import restraints. And Honda will see both increases in production at Marysville and greater acceptance of the Acura. Honda's success has been based primarily on quality, and the emphasis on quality seems to leave Honda in continually short supply. AI

WHAT'S HOT! Domestic Auto Sales (1st Quarter Results)

Carline	'87	'86	% Change
Cavalier	95,210	100,079	(4.87%)
Celebrity	85,642	99,230	(13.69%)
Escort	84,561	91,843	(7.9%)
Taurus	78,635	36,580	114.69%
Ciera	62,584	82,441	(24.09%)
Accord*	72,227	70,164	2.94%
Tempo	60,821	65,462	(7.09%)
Sentra*	62,194	43,832	41.89%
Grand Am	50,691	46,697	8.56%
Mustang	49,974	39,352	26.9%

*—Includes imports
( )—Negative value

US Passenger Car Market Shares To Date

Manufacturer	Sales	% Total
General Motors	878,784	37.78%
Ford	464,744	19.98%
Chrysler	258,272	11.10%
Honda/Acura	160,080	6.88%
Nissan	143,445	6.17%
Toyota	108,411	4.66%
Subaru	34,943	1.50%
VW	32,716	1.41%
AMC/Renault	8809	0.38%

Continued

Passenger Car Market Share By Geographic Base

Manufacturers	Total Sales	Total Market Share
American	1,518,914	65.3%
Japanese	459,467	19.75%
European	198,293	8.52%
US Built Imports (VWUS, Honda, NUMMI, Nissan, Renault, Toyota	149,398	6.42%
Total	2,326,072	100.00%

Domestic Light Truck Quarterly Production

Truckline	3-'86	4-'86	1-'87
Chrysler Vans	19,651	32,313	33,871
. Sport Utility	6441	6830	7380
....Miniwagon	56,811	69,844	76,909
Lt Conventional	48,812	64,216	63,795
Ford Aerostar	41,142	41,153	51,405
..... Bronco	10,322	10,322	16,626
..... Econoline	45,957	58,079	62,014
..... Ranger	73,124	76,941	87,788
..... Bronco II	25,081	30,648	32,369
..... Light Conv.	146,735	98,750	178,156
Chevy .. Blazer	6352	7255	8825
.....Suburben	13,582	12,257	16,259
..... P-Model	7608	7846	11,425
..... S-10	66,846	46,650	54,613
Truckline	2-'86	3-'86	4-'86
..... Blazer S	42,977	33,445	45,433
..... Astro	39,270	38,114	41,308
..... Van	27,386	24,165	38,056
Light Conventional	89,385	76,470	75,824
..... Sierra	--	1531	37,762
GMC . Jimmy	2263	2453	2431
.... Suburban	5989	7083	6191
..... P-Model	1135	1861	1729
..... S-15	16,646	12,759	14,609
..... Jimmy S	12,053	10,287	11,579
..... Safari	9632	9664	10,263
..... Van	8069	8360	12,560
Light Conventional	30,213	26,051	24,953
..... Sierra	--	610	12,776
Nissan. Pkup	23,135	20,228	21,569
AMC Grand Wagoneer	--	--	4363
.. Cherokee/ Wagoneer	--	--	39,296
.. Comanche	--	--	11,697

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AUTOMOTIVE INDUSTRIES

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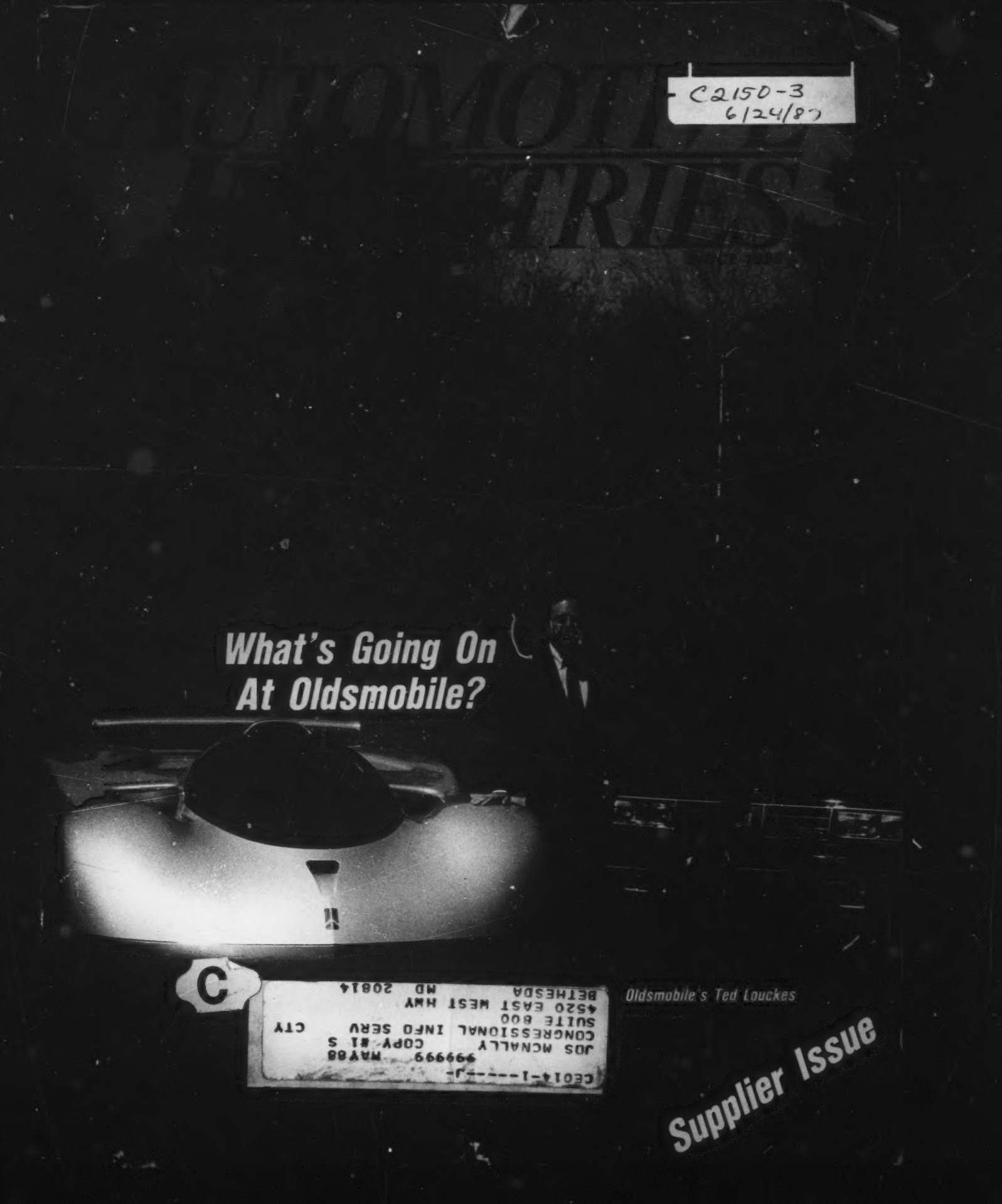

Oldsmobile's Ted Louckes

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CIVIL WAR! COMPUTER CONTRAS STRIKE MIS

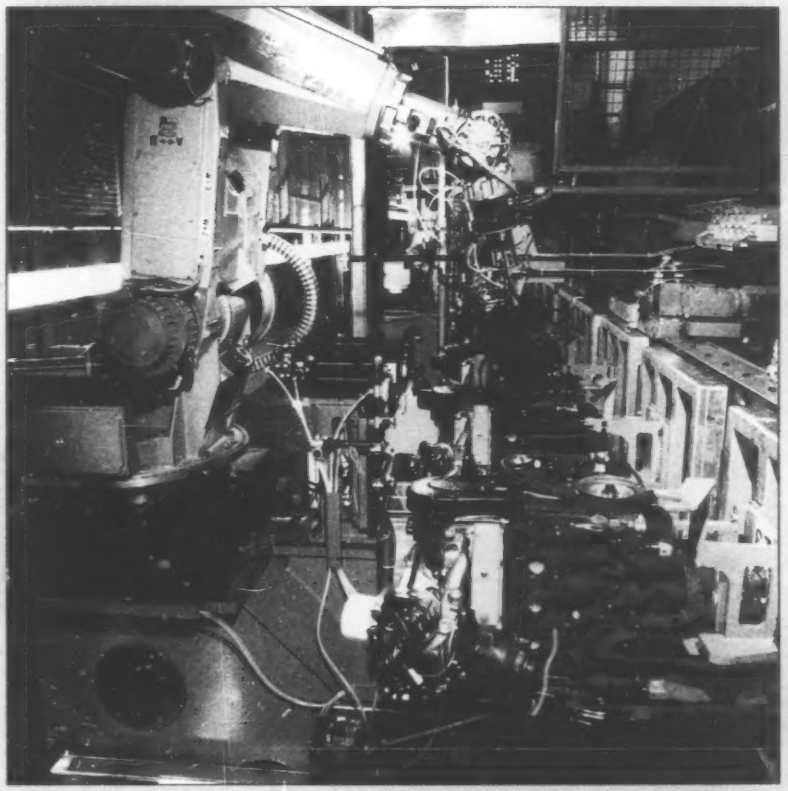
In many companies, the peaceful rule of management information systems may be in jeopardy, as CPU irregulars shake up the technical hierarchy.

by Bill Kalb

Traditionally, management information systems (MIS)/data processing departments are charged with overseeing company computer networks and users.

But the proliferation of microcomputers, programmable cell controllers and other CPU-based devices opens up a world of high-tech attacks to the company's technical side. The pervasiveness of high-tech solutions is undermining the neat lines of responsibility and command in the computer field and setting the stage to escalate intra-company conflicts.

Currently, the MIS-technical conflicts in manufacturing center around the integration of computer-aided drafting, engineering and manufacturing systems (CAD/CAE/CAM). At the same time there is the effort to gain company-wide cooperation for new solutions such as artificial intelligence (AI), to achieve computer-integrated manufacturing (CIM).



AI may be the answer to computer-integrated manufacturing (CIM).

Organization Changes

"The desire for integration of existing systems is a manifestation of a general move toward CIM," says Joel Orr, consultant.

"It means that the organization will have to change because the architecture of computing systems must reflect the structure of the organization," he continues. "It is very important that the systems you develop today are sufficiently flexible to accommodate the required changes."

In engineering and manufacturing, the problems begin as PCs and cell controllers sneak in to do things MIS couldn't—or wouldn't—do. Then came the drafting programs—packages ranging in price from $200 to $5000—necessitating full memory complements, hard disks and plotters. Minicomputers and mainframes snuck in behind MIS's back—computers run by engineering and manufacturing personnel.

"Each system was bought to solve some gnawing technical problem. About a third of the systems will be doing what they are supposed to do; the remainder will be adding to the confusion," explains Orr.

But each device fell within the purchasing authority of some technical manager. As a result it didn't draw the attention of those whose duty it is to maintain the integrity of the company's information processing.

(Continued on p. 83)

The technical buyers got around corporate computer purchasing policies by not calling the systems computers. Instead, they were listed as drafting machines, numerical control systems, lettering devices—almost anything that avoided the words computer or data processing system.

The smaller ones never reached the capital equipment appropriation board because their prices were below the threshold. Larger systems were all rented or leased.

Ronald Meyer, former manager of advanced manufacturing technology and programs at automotive and military systems supplier Rockwell International Corp. and now a consultant, remembers. "We had to go to MIS for approval of expenditures above a certain amount," Meyer recalls. "We needed some expensive equipment like Lisp machines, DEC VAXs (minicomputers) and software."

Invading MIS Turf

MIS, says Meyer, made it clear that the manufacturing-engineering group, engaged in making high-tech systems for missiles and space shuttles, was invading its territory.

Meyer attributed such attitudes to MIS's view of itself as the "keeper of computer resources."

"MIS is threatened by users' growing computer proficiency, where it should be more interested in putting more capabilities in the users' hands," contends Myer.

"Information is of growing importance to the organization," emphasizes Bill Congleton, Nissan Motor Corp. USA's director of information systems, "but we have to deliver what's needed to run the business.

"My objective is to spend more effort in defining roles, objectives and strategies of the corporation," he says. "Somehow you've got to get users and machines to function together and not fight that technology."

When it comes to empire building and maintaining the status quo, engineering's hand's are hardly clean.

"The engineering or scientific departments are doing the advanced work and they are keeping MIS out," says James Rumbaugh, a computer scientist at General Electric Co.'s Corporate Research and Development Center. "This exclusion tendency can work both ways."

Chrysler's Brauburger cites committee system as problem-solver.

Committee Power

Conflicting needs, personalities, philosophies and corporate politics can exacerbate the conflicts. To integrate the systems, three types of approaches are used: committee, inclusion of technical management in MIS structure, and requiring the technical computer management to report to MIS. Still extant is the separation of CAD and technical information systems from MIS.

Cary Coverdill, supervisor of CAD methods at American Motors Corp., notes that AMC's CAD operation, which began automating in late 1983, is "distinct from the MIS group" on matters that pertain to specific departments. "On matters of procuring engineering systems, MIS doesn't get involved," he states. "However, all AMC departments are consulted on general purpose issues that affect the entire company such as purchases of word processors."

Chrysler Corp., however, favors the committee system. "The conflicts between MIS, engineering and manufacturing have historically been a problem in American industry," says Robert Brauburger, chief engineer at Chrysler Corp. "The majority still struggle with it. We have set up a committee to eliminate that problem." The committee includes representatives from manufacturing, engineering and MIS.

Brauburger explains that engineers have a highly academic background while manufacturing is mainly made up of pragmatists. The MIS representatives represent strictly a business background. "Each (area) is different in its methods and approach," says Brauburger. "You use a different type of person in each of the three areas."

Productivity Gains

The only way to satisfy individual needs and meet overall corporate goals is to stress communications, advises Brauburger. By doing so, his committee has managed to develop a five-year plan that maps out how Chrysler will develop different interfaces between brands of computers.

Chrysler's windfall from its five-year plan have been productivity gains ranging from 30% to 300% (*see March AI, p.61*) and a company-wide database necessary for CIM.

The automaker uses an IBM 4381 to serve as a gateway between the technical and business information systems. "It allows the technical computer center and the IBM computers to share files," says G. Nicholas Simonds, Chrysler's director of MIS.

The Number Three automaker seems close to fulfilling the prediction of Phillip Armstrong, director of manufacturing systems for TRW Automotive Worldwide: "Eventually, design, engineering and manufacturing will have to sit down together, and product design and planning will have to be done concurrently."

TRW Automotive is linking its engineering and materials resource planning (MRP II) of MIS and CAD into an integrated database, using a program called CADlink.

"Tools like CADlink and other management databases are becoming increasingly important to meet the

(Continued on p. 85)

goals of improving product quality," says Armstrong. "It will help streamline information transfers out of CAD and into business systems."

Before TRW Automotive began using the program, technical information was first passed to an engineering support group, whose job it was to translate data into a form usable by MRP II systems.

Let EDS Do It

"At GM," says Chain Sandhu, staff development engineer at the Fisher Guide Division, "we are seeing more and more people with data processing backgrounds becoming informed about plant floor level activity, while plant managers are becoming increasingly computer-literate."

The education process is part of GM's ongoing drive to automate its manufacturing. Electronic Data Systems, bought three years ago by GM, functions as the company's MIS department. Its goal is to set up a structure to support widespread automation. "In factory floor planning and acquisitions, individual production and engineering staffs tell EDS what they need and EDS assures compatibility," explains Sandhu. "EDS makes sure it gets integrated."

This procedure was used when Fisher Guide brought in Allen-Bradley Vista 2000 cell controllers.

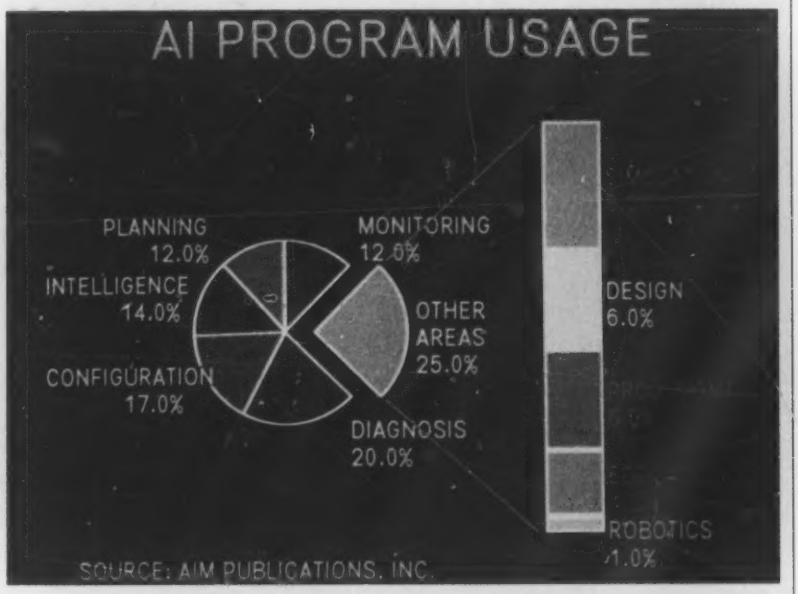
Although it looks good on paper and can work, it has generated resentment among GM engineers and manufacturing groups—a factor contributing to the "indigestibility of EDS."

The Fight Over AI

Eventually the goal of all this integration is a company-wide standardized database equally accessible to MIS and the technical side and necessary if CIM is ever to be a reality.

Meanwhile, back in the trenches, MIS, engineering and manufacturing are at loggerheads over the implementation of artificial intelligence programs to integrate today's with tomorrow's technology.

Whether for reasons of pragmatism, as MIS personnel insist, or conservatism as AI disciplines claim, MIS and AI aren't mixing well in most large companies. The automakers are no different.



MIS and AI aren't mixing well in most large companies. The automakers are no different.

All the artificial intelligence programs that are being used are developed in and for the technical side; 60% for engineering and manufacturing and 35% in R&D. AI programs for MIS functions and data processing have been around longer and are more developed, yet account for only 5% of those programs now in use.

One of the problems is that AI came first and early for office applications, but frequently performed below expectations, leaving a bad taste in the mouths of MIS/dp departments. Also, AI is frequently user-driven, threatening the control of corporate computer power structures.

"Surveys show that 80% of the Fortune 500 corporations are investigating AI," says George Hairston, president of AI Services Co. "Nearly all these experimenters are in research and development facilities, advanced applications development groups or other technical areas. They are not in information systems."

Ronald Meyer, the formal Rockwell advanced manufacturing technology manager, says groups like those in missile guidance and control systems and space shuttles were actively pursuing expert systems to meet needs, but there was a lack of support from MIS.

"Engineering and computer science groups had to champion the cause of AI," he relates. "MIS didn't want to get involved. If it didn't cost $6 million and take six years to develop, MIS said it was no good."

While the computer center retains control of the IBM mainframes, researchers can use VAXs and do whatever they want. AI specialists grew up perfectly comfortable outside the computer center. In fact, few of them are willing to do AI development on MIS's mainframes because the user interface is usually pretty awful.

"MIS cooperation is an evolutionary process," says Westinghouse's Nicholaus. "MIS managers see that they are going to integrate AI applications into the general system. We'll see more of this cooperations in the next three or four years." AI

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Transplants Thrash Big Three In Productivity

by Lance Ealey and John McElroy

Detroit's best still isn't good enough in the productivity race. For years, American automakers have blamed everything from the strong dollar to an inherent workforce advantage in explaining why they couldn't stand toe to toe with Japanese automakers in terms of productivity.

As recently as four years ago, US auto executives were openly skeptical of the ability of Japanese transplants to better the productivity levels of domestic American assembly operations. The oft-used term "level playing field" summed up the thinking of many American auto executives in predicting the difficulties Japanese manufacturers would have in running their US operations.

Level playing field or no, the Japanese have beaten US productivity levels handily. A recent look at the performance of some of the newest and most efficient American automaker facilities compared to the transplants shows that the Japanese enjoy in some cases as much as a 2-to-1 productivity advantage over Big Three US assembly plants.

An interesting wrinkle involves NUMMI, the Toyota-managed GM/Toyota joint venture plant in Fremont, CA. NUMMI has a UAW-organized workforce, though the union agreed to significant work-rule changes for this plant. Still, NUMMI, along with Honda's Marysville, OH operation is the most productive of the transplant facilities.

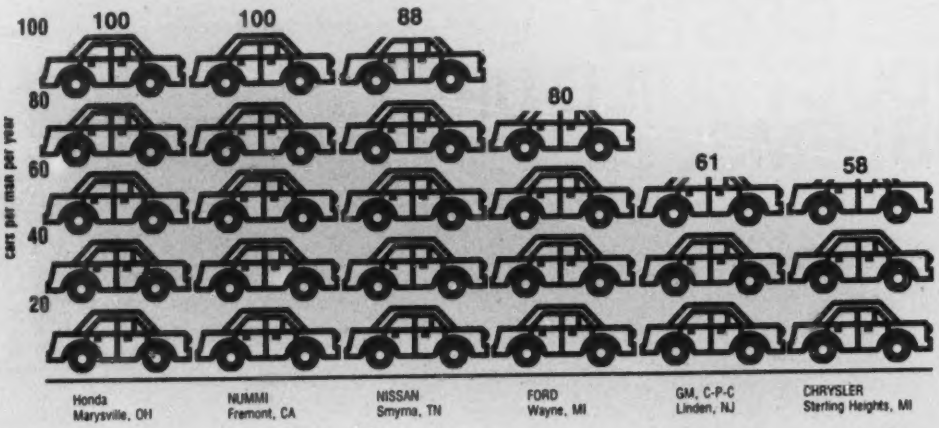
It's also worth noting that all of the transplant assembly operations include on-site stamping facilities and workforces, while the Big Three facilities do not.

Another point that shouldn't go unnoticed is that some of the Japan-based assembly operations of Japanese automakers are significantly more productive than the transplant facilities. Toyota's Tahara passenger car and truck assembly operation, for example, builds 125 vehicles per employee per year.

All of the cars built by Japanese transplants are subcompacts. However, in terms of price and option complexity, Japanese vehicles such as the Honda Accord compete evenly with many of the domestic models listed below. It's also interesting to note that Ford's Wayne, MI Escort plant, which builds the company's entry-level domestic offering and is the most productive of the US plants, is 24% less efficient than Honda's Marysville facility, which builds both entry-level and up-market vehicles.

The plants *AI* compared and the cars they produce are as follows: Honda Marysville, OH: Civic/Accord—100 cars/man/year; NUMMI Fremont, CA: Chevrolet Nova/Toyota Corolla FX—100 cars/man/year; Nissan Smyrna, TN: Sentra/pickup truck—88 vehicles/man/year; Ford Wayne, MI: Escort—80 cars/man/year; Ford Atlanta, GA: Ford Taurus/Mercury Sable—76 cars/man/year; GM C-P-C Group Linden, NJ: Chevrolet Corsica/Beretta—61 cars/man/year; Chrysler Sterling Heights, MI: Dodge Lancer and Shadow/Plymouth Sundance/Chrysler LeBaron GTS—58 cars/man/year; GM B-O-C Group Lansing, MI: Pontiac Grand Am/Oldsmobile Calais/Buick Somerset—53 cars/man/year; GM C-P-C Group Doraville, GA: Buick Century/Oldsmobile Ciera—46 cars/man/year. AI

Home Court Advantage Fizzles As Japanese Beat Big Three in US Productivity



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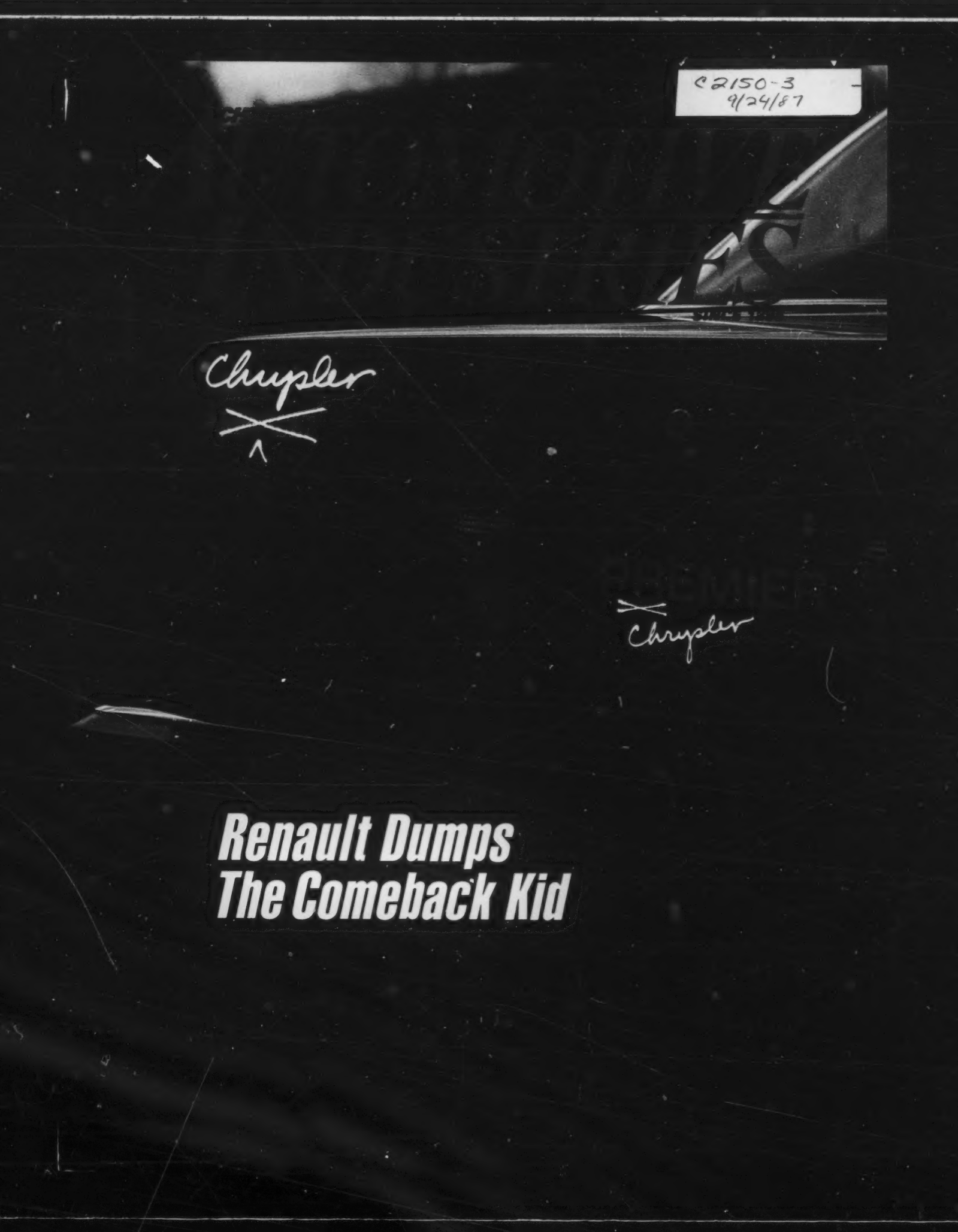

Renault Dumps The Comeback Kid

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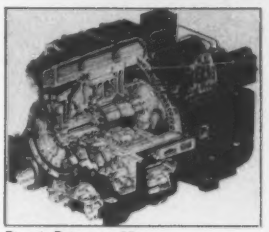

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Move Over, Cabover

by John Stark

A dramatic skid in US demand for heavy-duty cabover engine (COE) vehicles may come to a screeching halt this year, some truck industry officials believe. But the tread marks from fast-moving conventional trucks may take years to wear off.

Navistar International and Freightliner, for example, have sharply raised their penetration in the slumping Class 8-type, high COE heavy truck business with respective 1986 market shares of 41½% and 27½%. That now far surpasses rivals.

Kenworth and Freightliner, closely trailed by Peterbilt and Navistar, are perched atop the growing long-nose conventional truck market. Navistar and Volvo White have narrowed the gap on Mack's dominant, venerable position in the medium-length conventional truck market segment.

Demand Flux

Three factors are responsible for the dramatic shift in demand from COE to conventional trucks and vastly changed market positions, in high volume segments of the Class 8 commercial vehicle business:

- Truck price discounting, spawned by falling COE truck demand.
- Birth of the aerodynamic "Baby 8" truck in the lower end of the expanded Class 8 (33,001 GVW and over) conventional vehicle market.
- New construction-type truck product entries in the medium-length conventional segment of the business.

US demand for Class 8 COE-type trucks has been bouncing up and down like a yo-yo since 1980. Much of this has been caused by uncertainty over commercial trucking deregulation by the US government. Truck

John Stark is editor and publisher of Stark's Off-Highway Ledger.

length and width were extended. The deregulation led to the setup of regional distribution hubs by major trucking fleets, a subsequent reduction in the horsepower requirement for a typical commercial vehicle (250-hp and lower) and a profound switch in truck use from COEs to conventionals.

Look What the Stork Brought

Bingo! The Baby 8 truck was born. A Baby 8 truck is generally defined as an aerodynamic, conventional-type vehicle weighing slightly more than 33,001 lb GVW (*14,950 kg*), containing a 250-hp diesel engine and a midrange-type truck drivetrain.

Kenworth is credited as giving birth to the first Baby 8 heavy truck with its T600A model. Its share of the long-nose conventional truck business soared nearly 4% in 1986; Kenworth is now the leading US seller of long-nose conventionals, followed by Freightliner, Peterbilt and Navistar.

Most market participants either have or soon will have Baby 8s in the US market. By the end of 1986, Baby 8s accounted for 16% of overall truck sales. A peak of roughly 20% is seen by some truckmakers, such as Mack, before Baby 8 growth runs out of steam.

However, stringent federal engine emission regulations scheduled for 1991 may play into the hands of conventional-type truck producers as they install electronic engine and transmission controls on the powertrains of hot-selling conventionals, in order to meet particulate engine emission standards.

COE For Sale: Cheap

A glut of older COE-type truck trade-ins, containing outdated component technology and low sticker prices, may toss a damp towel on production schedules for new Class 8 COE tractors over the next 1-2 years.

T&OHI asked the rhetorical question on the cover of our March/April 1981 issue: Are Cabovers Dying? They sure did. US demand for COE trucks bottomed out in 1981, peaked in 1983 and is still in the dumps.

In that cover story, Ford's heavy truck development manager said, "If we allow another 5 ft (*1.5 m*) for a cabover tractor, there may be a decided (10% to 40%) shift from short conventionals to medium and long conventionals, and from cabovers to medium- and long-noses." The shift came in—at about 16½%.

GMC's chief engineer-body and sheet metal had said "If the Cannon amendment [length and width extension] passes, it'll be a whole new ball game."

Bingo!

CLASS 8 COE VS. CONVENTIONAL TRUCK DEMAND

	1986	1985	1984	1983	1982	1981	1980	1979
Cabover Engine	25.5%	32.5%	40%	45.5%	42%	39%	39%	41%
Conventional	73.5%	66.5%	59%	54%	57.5%	60%	59.5%	57.5%
Others	1%	1%	1%	.5%	.5%	1%	1.5%	1.5%
Total	100%	100%	100%	100%	100%	100%	100%	100%

AUTOMAKER QUARTERLY REPORT

Second quarter '87 results reveal a Korean beachhead, Ford flying high, Chrysler lagging, and a share-losing General.

by Dr. Thomas O'Grady

Stabilization at 139 yen to the dollar and the recent slight climb to 150 yen to the dollar helped the Japanese automakers resist further price increases. While the worst may be over for the Japanese, expect the dollar to further erode. By that time, however, they will realize productivity gains.

This year, car sales will total about 10.1 million units, while sales in 1988, a presidential election year, will climb to 10.7 million units.

Incentives will continue as a regular marketing tool. However, they are in danger of losing their effectiveness as a sales tactic. Consumer confusion over the extensive combination of choices between low financing and rebates seems to be pushing down sales of traditional domestics while captive imports and transplants claim an increasing proportion of the market.

In 1987, GM will experience a continued loss of share. Their most recent policy of adjusting to lower share assures that the loss will be permanent.

Dr. Thomas O'Grady heads Integrated Automotive Resources, Inc. in Wayne, Pennsylvania.

Chrysler's share of the market dropped from 11.1% in first quarter '87 to 10.4%. This was partially the result of the temporary loss of Omni/Horizon output during the changeover at Kenosha, which hurt Chrysler both in showroom draw and sales. New products, such as the upcoming A- and C-bodied cars, should boost ChryCo's lagging sales.

Ford continues to fly high with sales as well as profits in '87. The Escort nudged past two Chevrolet models to become the Number 1 selling car in the quarter—and Taurus was right behind it at Number 2.

The most recent round of imports from Korea, which include Hyundai cars, the Mitsubishi (Hyundai) Precis, Ford's Kia-built Festiva and the Pontiac LeMans from Daewoo, is quickly making the Korean manufacturers major players in the industry. Any reprieve from the Japanese for domestic automakers is quickly absorbed by these Korean imports. AI

WHAT'S HOT!
Domestic Auto Sales
(2nd Quarter Results)

Carline	'87	'86	% Change
Escort	107,031	107,073	(0.04%)
Taurus	96,445	65,967	46.20%
Celebrity	92,510	118,571	(21.98%)
Accord*	76,961	72,608	6.00%
Cavalier	71,655	107,164	(33.14%)
Excel	70,892	41,376	71.34%
Clera	65,991	88,437	(25.38%)
Tempo	65,284	62,595	4.30%
Corsica/ Beretta	64,327	0	–
Sentra	62,274	54,722	13.8%

*– Includes imports
( )– Negative value

US Passenger Car Market Shares To Date

Manufacturer	Sales	% Total
General Motors	1,911,970	37.64%
Ford	1,031,187	20.30%
Chrysler	543,588	10.70%
Honda/Acura	335,582	6.61%
Nissan	282,952	5.57%
Toyota	260,205	5.12%
Subaru	77,517	1.53%
VW	91,533	1.80%
AMC/Renault	21,969	0.43%

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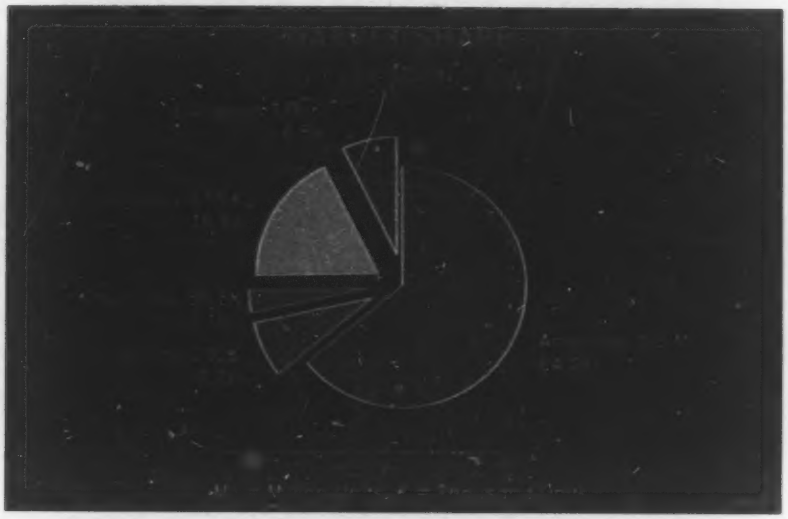

Passenger Car Market Share By Geographic Base

Second Quarter 1987

Manufacturers	Total Sales	Total Market Share
American	1,764,628	64.08%
Japanese	513,068	18.63%
European	177,909	6.46%
US Built Imports (VWUS, Honda, NUMMI, Nissan, Renault, Toyota)	211,660	7.69%
Other Imports (VW Fox, Ford Festiva, Hyundai)	86,554	3.14%
Total	**2,753,819**	**100.00%**

Domestic Light Truck Quarterly Production

Truckline	4-'86	1-'87	2-'87
Chrysler Vans	32,313	33,871	30,439
. Sport Utility	6830	7380	6397
... Miniwagon	69,844	76,909	101,387
Light Conventional	64,216	63,795	59,946
Ford. Aerostar	41,153	51,405	45,495
..... Bronco	10,322	16,626	12,781
.....Econoline	58,079	62,014	60,748
..... Ranger	76,941	87,788	78,310
..... Bronco II	30,648	32,369	35,160
Light Conventional	98,750	178,156	168,963
Chevy.. Blazer	7255	8825	9489
..... Suburban	12,257	16,259	17,427
.....P-Model	7846	11,425	12,146
..... S-10	48,650	54,613	41,784
..... Blazer S	33,445	45,433	46,194
..... Astro	38,114	41,308	42,913
..... Van	24,165	38,056	43,031
Light Conventional	76,470	75,824	60,148
..... Sierra	1531	37,762	52,328
GMC. Jimmy	2453	2431	2443
....Suburban	7083	6191	6427
..... P-Model	1861	1729	2021
.....S-15	12,759	14,609	13,950
..... Jimmy S	10,287	11,579	12,171
..... Safari	9664	10,263	10,614
..... Van	8360	12,560	15,195
Light Conventional	26,051	24,953	22,916
..... Sierra	610	12,776	17,576
Nissan Pkup	20,228	21,569	21,897
AMC Grand Wagoneer	--	4363	3457
... Cherokee/ Wagoneer	--	39,296	37,199
.. Comanche	--	11,697	12,000

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AUTOMOTIVE INDUSTRIES

SEPTEMBER 1987

SINCE 1895

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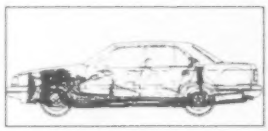

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Only a Phone Call Away

by Joseph M. Callahan

Will the telephone ever become as popular in cars as the automatic transmission? Most telephone industry people say this won't happen, but it's a possibility, considering the technology and the high volume economics now evolving in the mobile telephone industry.

One of those reasonably confident about the growth in mobile telephones in this country is Charlie Speight, operations manager of the Cellular Division of ARA Mfg. Co., a producer of many auto accessories. The company is headquartered in Grand Prarie, TX.

Speight and other observers of the mobile telephone business anticipate rather spectacular growth in the "marriage" of the car and the telephone. The reason: The technology is already largely available that will permit cost reductions of up to two thirds in the mobile phones and, more importantly, in the mobile service charges by 1995.

The two major technological advances expected are the fully digital cellular telephone service systems and the first Land Mobile Communications Satellite (LMCS).

The shift from the present analog to digital technology will permit adoption of multiplexing, message compression and probably a couple other advances which will make possible the transmission of four-to-six simultaneous conversations on a single mobile radio channel. This, unfortunately, will also obsolete the present analog cellular telephones.

Despite the additional cost of the new digital equipment for the telephone service providers, it's estimated that monthly service charges will decline from the present $150 for the fairly heavy business user (250 minutes a month) to $50 in eight years.

The digital technology will also result in smaller and more efficient mobile telephones, enabling them to operate on less power for longer periods of time. Telephones as small as Dick Tracey's watch are on the horizon.

This technology and other advances will also permit estimated reductions up to 67% in the "real" retail price of mobile telephones by 1995. This would mean a retail price of $400 to $500 for a phone, compared to the present $1200 to $1800.

Mobile Myriad

The LMCS for transmitting mobile telephone signals will make possible the use of cellular telephones in every city in the country, greatly increasing the demand for mobile telephones and service. Yet cellular phone service is now only available in 130 US markets.

Yet the nationwide use of cellular service will be limited to cities with enough potential business to justify the investments needed for the cell sites where the calls are completed.

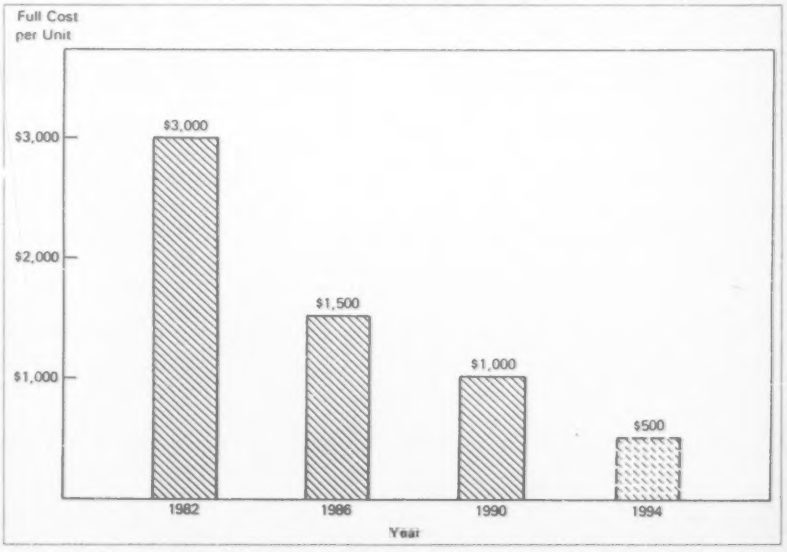
The LCMS would not directly impact the other two mobile telephone systems in this country. These are the IMTS (Improved Mobile Telephone Service) which began in 1945 and the SMR (Specialized Mobile Radio) system. These two systems will probably continue operating, although the cellular system is expected to be the dominant system.

Speight also said that several spin-off technologies are already here or are coming along that will greatly increase the value of the mobile telephone to both business and private users. Now available in many markets is an "electronic mail box" that will accept messages when the mobile phone owner can't take car calls.

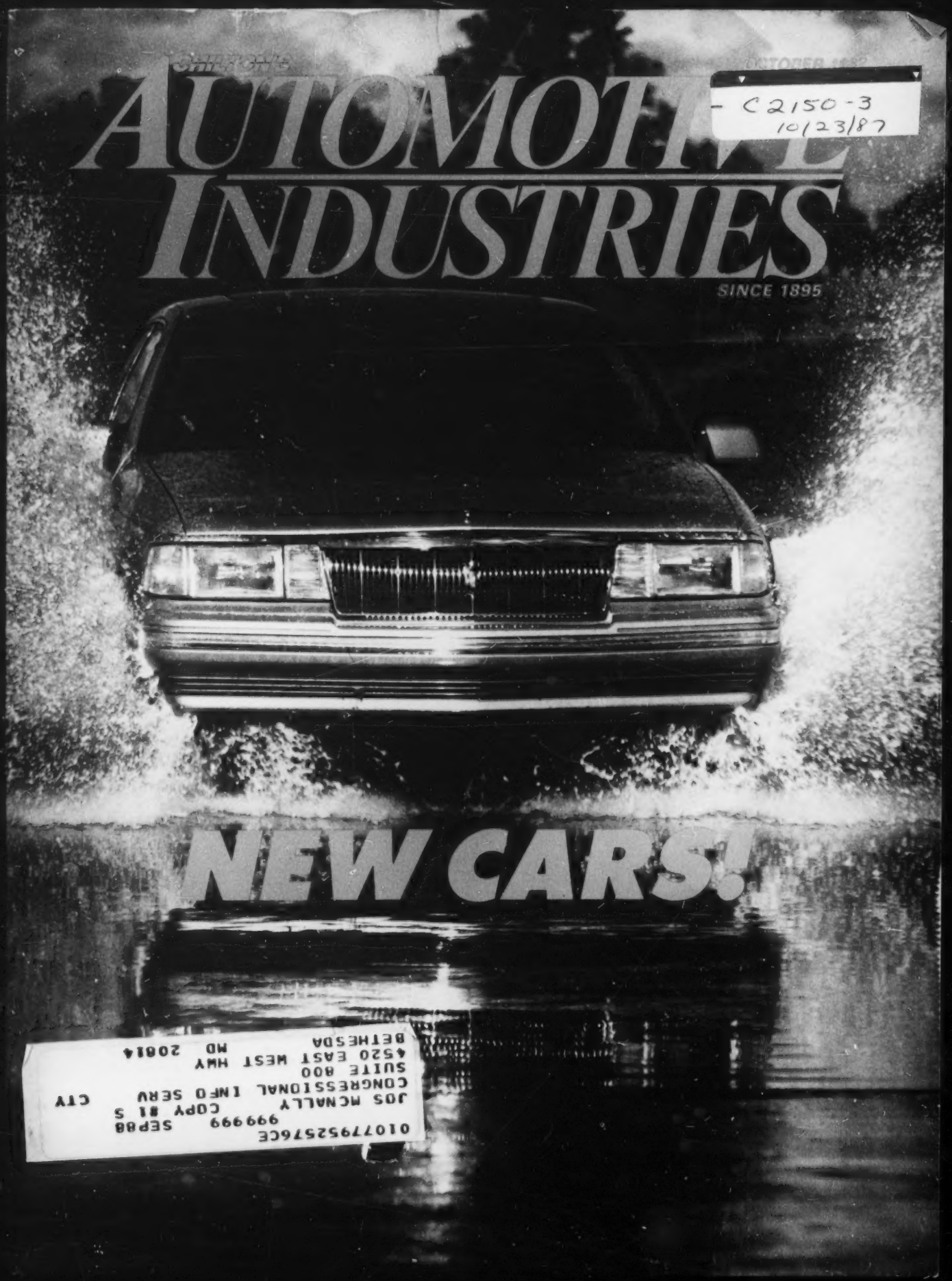
When the driver returns to his car, he'll find a little indicator on his telephone display that will simply say "call." By calling the voice mail box, the driver can retrieve his calls. This saves a great deal of time and eliminates the "phone tag" that plagues many people.

ARA and other mobile telephone firms are now offering voice recognition telephone systems that enable the user to "command" his telephone to dial a couple dozen places and individuals. These systems usually have a microphone built into the phone cradle, so the motorist can complete the entire call without taking his hands from the steering wheel.

Finally, many cellular telephone systems already have the capability of transmitting data over a mobile phone. Speight said the use of this capability is bound to increase, especially vehicles that need to transmit data. AT



Forecast for cellular telephone units, assuming production-justified prices.



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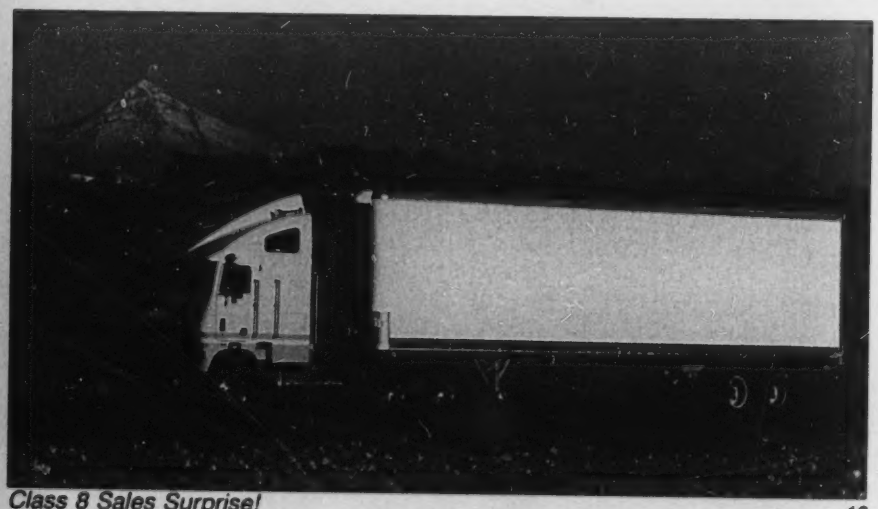

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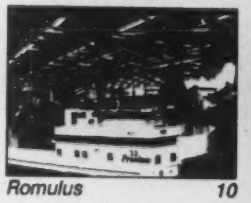

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In December, T&OHlooks at the rebounding ag scene.

Farm Outlook: Recovery At Hand!

by John Stark

A seven-year plunge in North American farm machinery business has hit rock bottom.

Recovery is finally at hand!

The forecast of better days ahead sounds like another false start to firms hemorrhaging at the bottom line. However, farm machinery producers who pay real close attention to US and Canadian movements in the used and new machinery markets have a front row seat in the current recovery now under way in the farm business.

Let's ignore US farm acreage plantings, dairy farm activity, note cash and farm income, exports, total farm debt, real estate values and debt-to-equity ratios. Instead, let's focus on the real issue—actual buying of farm tractors and self-propelled combines.

Sales of used compact (below 40-hp) and dairy-type (40- to 99-hp two-wheel-drive) farm tractors have been on the rebound since the fall of 1986. It took five to six months of steady decline in dealer stocks of the used tractors, *via* higher used tractor sales, to drive up the value of remaining good, used tractors still in inventory.

Hence, used tractor values have been rising strongly since April 1987. The value of good, used dairy-type tractors has soared more than 33% since last spring. Three to six months of steady rises in used tractor values are needed before a peak occurs.

Retail turnover of new dairy-type farm tractors started to turn around in the middle of this past summer.

Yet, farm machinery business normally doesn't recover all at once. The rebound occurs in stages—one industry segment at a time—and is largely affected by a key business fundamental known as elasticity of demand.

John Stark is editor and publisher of Stark's Off-Highway Ledger.

Under the current scenario, new dairy-type farm tractors are the first vehicles to register higher retail sales at dealer outlets due to runup of used tractor values. Two-wheel-drive (2wd) tractors of 100-hp or more have seen their used values rise since June 1987. Widespread turnaround in new tractor sales should occur by early 1988.

However, retail sales of these new, higher horsepower 2wd tractors have been climbing since late summer 1987.

Industry insiders link gains in new, higher horsepower 2wd tractors to a widely successful stock liquidation program at JI Case. Case is attempting to clear out inventories of new but older lines of tractors, to make room on dealer lots for four new models of 130-195 PTO-hp, 7100-Series "Magnum" machines. Magnum tractors started rolling off the assembly line in Racine, WI during mid-October.

Subsequently, genuine turnaround in the over-100-hp 2wd new tractor business isn't anticipated until February-March 1988.

Compact tractors, machines primarily imported from Japan, have seen their used tractor values rise since April 1987. Yet, the rebound in used vehicle values hasn't been as dramatic as that of dairy-type farm tractors for one simple reason: A lot of compact tractors were imported to North America and stocked at dealer outlets under an older, more restrictive yen-to-the-dollar pricing structure. It should take another six to eight months before newer stocks of the same vehicles favorably work their way onto the retail scene.

Since mid-summer, used combine values have been on the rebound. Certain manufacturers have been detected shifting used combines from low- to high-value areas of the US—a first sign that inavailability of used machines will soon lead to improved sales for the new machines.

But looming cutbacks in federal pricing supports by the Canadian government is expected to toss a wet towel on demand for combines in Canada during the remainder of this year and for all of next year. The extent of falling vehicle demand in Canada should offset any gains that occur in the US. So, a turnaround in new combine sales might not materialize until late 1988 or early 1989.

Many manufacturers have given up hope for rebound in the four-wheel-drive (4wd) tractor business. Used tractor sales remain sluggish. Used tractor values are weak and new tractor turnover continues to disappoint industry diehards.

But don't get stuck in a furrow over 4wds. Two-wheel-drive tractors are where the action is.

Gentlemen, start your engines... ■

NORTH AMERICAN FARM MACHINERY SALES OUTLOOK

	1988	1987	1986	1985	1984	1983	1982	1981	1980
Below 40 hp	69,800	68,500	65,790	60,620	54,495	48,310	44,995	51,555	49,815
40-99 hp	45,800	39,795	40,195	46,265	46,935	44,925	49,675	61,815	71,450
100 hp & over	19,400	15,525	19,405	22,670	29,090	33,775	35,595	51,695	58,505
All 4WDs	2,900	3,200	3,650	5,580	6,325	7,555	9,975	14,050	14,500
Ttl. Tractors	137,900	127,020	129,040	135,140	136,845	134,565	140,240	179,115	194,270
Combines	9,200	9,695	10,770	11,260	14,220	15,680	19,750	31,890	29,150
Grand Total	147,100	136,715	139,810	146,400	151,065	150,245	159,990	211,005	223,420

SURPRISE OF THE YEAR!

Class 8 sales are topping all expectations.

by Douglas Williams

John Rock's a pretty typical industry executive when it comes to predicting 1987 Class 8 truck sales—and then being wrong about it. "I guess I've been sort of a gloom and doomer on the industry," says the head of GMC truck operations, who last January predicted industry sales of 112,000 units. Sales for the year will easily top that by 20%-plus.

"I really didn't think if you looked at the economy and the statistics and forecast and projections that it would generate the kind of buying we've seen. It's good to be wrong" in that direction, Rock says.

Peter Rupp, the outspoken head of Daimler-Benz's Freightliner subsidiary, had expected 1987 to be in the range of 120,000 Class 8 trucks. Rupp, says he thinks 1987 will end up with Class 8 sales of about 129,000-130,000.

> There's just a lot more going on in the US than we had thought in trying to become competitive. I think that has generated a lot of specialized vehicle useage.

Rupp echoes the industry's general prediction that tougher truck engine emissions limits would pull demand ahead, but instead the standards were eased. Then too, the average age of big trucks stands at 7.9 years; Rupp notes that a lot of people replaced their older trucks in '87 because new ones are so much more efficient.

Why The Boom?

Ken Smith, head of heavy truck operations at Ford, says the Class 8 business will hit 125,000 "and possibly 130,000" for the present year. Smith comments that the business has surprised a lot of people.

Still, the question nags: Where did all the big truck sales come from? John Merrifield, general sales manager of heavy trucks at Ford cites four reasons:

- The general aging of the nation's truck fleet.
- Lower prices related to excess capacity.
- A wave of new products that is stimulating buyer interest. Included here are much more economical powertrains, improved aerodynamics and boosts in driver comfort.
- Some people attempting to find a tax advantage in buying new trucks. That's perplexing, because most truck industry executives don't see any obvious tax advantage with the new laws.

A fifth reason could be added: The significant recent reduction of supply of used Class 8 vehicles.

To GM's Rock, the reason for the Class 8 sales boom is more basic: it's because America is simply getting more efficient and productive. "I give most of the credit to deregulation and the fact there is so much going on in the cost reduction process for American industry. You're really getting into specialized uses," he says, adding that there's demand in each one of those specialties.

Rock talks about the brand-new GM pickup truck plant in Indiana when he wants to illustrate America generating unexpected demand for big trucks by getting more efficient overall. "I went down to the Ft. Wayne truck plant for a tour and they only have 120 units of inventory, with not one railroad siding even on the property.

"There's just a lot more going on in the US than we had thought in trying to become competitive," Rock says. "I think that has generated a lot of specialized vehicle useage." He guesses, for example, that "70% to 80% of medium and heavy trucks are probably ordered for a specific usage.

"High inventories of capital goods is one of the things American industry has taken out of the business equation," Rock offers. "You take a look at all of the things you've got to do to reduce your costs. At General Motors we have taken a real percentage out of our inventory that's in the billions of dollars. I've got to believe that everybody's doing it, from the customer to the dealer to the whole supply line," Rock says.

SURPRISE!

1987 Class 8 Sales Blitz

	1986	*1987*
Navistar	26,300	28,000
PACCAR	20,500	24,000
Freightliner	17,500	22,100
Mack	17,250	20,000
Volvo/White	11,350	14,700
Ford	11,300	12,400
GMC	7,750	7,600
Others	1,000	1,200
TOTAL	113,000	130,000

If there's substantial surprise about Class 8 truck sales being up—and there certainly is—one other item's sure: There may be no agreement about why, but nobody is complaining. ■